

REDACTED – FOR PUBLIC INSPECTION

August 25, 2014

Via ECFS

Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20554

Re: *In the Matter of Applications of Comcast Corp. and Time Warner Cable, Inc. for Consent to Transfer Control of Licenses and Authorizations*, MB Docket No. 14-57

Dear Ms. Dortch:

Pursuant to the Joint Protective Order¹ in the above-captioned proceeding, Cogent Communications Group, Inc. ("Cogent") hereby submits a redacted version of the Declaration of Joseph Farrell ("Declaration") in support of Cogent's Petition to Deny.

The Highly Confidential version of the Declaration is being filed under separate cover and will be made available for inspection pursuant to the terms of the Joint Protective Order.

Please contact me should you have any questions regarding this matter.

Sincerely,



Robert M. Cooper
Counsel for Cogent Communications Group, Inc.

Enclosure

¹ *In the Matter of Applications of Comcast Corp. and Time Warner Cable Inc. for Consent to Assign or Transfer Control of Licenses and Authorizations*, MB Docket No. 14-57, Joint Protective Order, 29 FCC Rcd 3688 (Apr. 4, 2014).

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Declaration of Joseph Farrell, DPhil

August 25, 2014

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I. Executive summary

- (1) Comcast and Time Warner Cable (“TWC”), like other consumer ISPs, operate in the two-sided market for bringing together content providers and individual consumers of Internet content. Both sides are customers of the ISP. The economics literature on two-sided markets suggests that generally one must consider both sides of the market, not each side in isolation, when doing an antitrust analysis. For this reason, in analyzing the likely competitive effects of the Comcast/TWC merger, one must consider the impact on consumers as well as on content providers and other networks.
- (2) The available evidence suggests, and the Federal Communications Commission (“Commission” or “FCC”) has previously concluded, that Comcast and other cable ISPs have market power over consumers. Although there are a number of different technologies that provide broadband access to the Internet, including fixed and mobile wireless technologies, fixed wireline technologies, and satellite, fixed wireline technologies are far superior to other technologies for data-intensive and bandwidth-intensive applications, such as downloading streaming video, an increasingly popular and valuable form of Internet content. Not only do fixed wireline broadband providers generally offer faster speeds but they also either do not cap or set generous caps on the amount of data that their customers are allowed to download. Mobile wireless and satellite broadband providers, on the other hand, set relatively low data caps (and/or charge high prices for usage above the cap), actions that would have the effect of severely curtailing video streaming if a consumer were to use such a connection as a full substitute for fixed wireline broadband.
- (3) To support his claim that Comcast and TWC lack significant market power in the provision of broadband Internet access, Dr. Israel cites FCC data showing that 97% of households are located in census tracts in which two or more *fixed-location* broadband providers report offering at least one customer at least 3 Mbps downstream and 768 kbps upstream.¹ However, the vast majority of households face a choice of at most two *wireline* broadband providers—the incumbent cable company and the incumbent phone company—which offer the technology best suited for applications such as streaming video.² Moreover, for many households (to a degree apt to be significantly underestimated by the methodology of that FCC report), the DSL service offered by the incumbent

¹ Implications of the Comcast/Time Warner Cable Transaction for Broadband Competition, Mark A. Israel, *In re Applications of Comcast Corp. and Time Warner Cable Inc.*, No. 14-57 (F.C.C. Apr. 8, 2014) [hereinafter Israel Decl.], Figure 1.

² According to the FCC’s *National Broadband Plan*, approximately 96% of the population in 2010 had “at most two wireline providers.” See FCC, “Connecting America: The National Broadband Plan,” released Mar. 17, 2010, at 37, available at <http://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf> [hereinafter *National Broadband Plan*]. See also DOJ, “Voice, Video and Broadband: The Changing Competitive Landscape and Its Impact on Consumers,” Nov. 2008, at 19, available at <http://www.justice.gov/atr/public/reports/239284.pdf> (“The principal competitors in providing residential broadband services continue to be: (1) the incumbent telephone companies, using either DSL over copper or more advanced fiber networks (such as Verizon’s FiOS); and (2) the incumbent cable companies, providing cable modem service over hybrid fiber-coaxial cable.”)

telephone company is inferior to the broadband service offered by the cable company. Not only is cable broadband service generally faster, but cable companies offer bundles of broadband and cable TV service, which at a minimum further differentiates their broadband product from that of many telephone companies.

- (4) The Applicants and Dr. Israel argue that the proposed merger will not raise horizontal concerns on the household side of the market because the parties do not compete in the same geographic areas.³ This is the same argument that several Bell Operating Companies made when they sought to merge over a decade ago. The Commission rejected that argument then and should reject it again in this case.
- (5) Comcast, even prior to the merger, has the incentive to engage in exclusionary strategies against competitors. In the *Comcast/NBC-U* Order, the Commission found that Comcast *specifically* had the incentive and ability to foreclose, disadvantage, or raise the cost of its rivals. Although the Commission imposed detailed conditions intended to mitigate the potential harms from the merger, those conditions are temporary and would not alter Comcast's *incentives* to engage in exclusion and anticompetitive discrimination. Moreover, some types of potential anticompetitive conduct simply do not appear to be covered by the merger conditions. For example, Netflix recently observed that discrimination within the last mile can be mimicked by congestion at points where Comcast interconnects with other networks; Netflix also has suggested that this is not just a possibility and that Comcast was deliberately slowing the delivery of Netflix content through that means.
- (6) The merger of Comcast and TWC will increase the merged parties' incentives to engage in exclusion and harmful discrimination by expanding the merged parties' footprint. As the Commission has previously recognized, exclusionary conduct by Comcast may often spill over and benefit other incumbent cable companies and/or incumbent ISPs outside Comcast's footprint. Post merger, Comcast will have a bigger footprint and will thus internalize a greater proportion of the anticompetitive benefits, which will increase its incentive to engage in such strategies.
- (7) The merger of Comcast and TWC will weaken the ability of the Commission, consumers, interconnectors, and competitors to use benchmarks to detect and address practices that harm competition and consumers. The Commission has long used "comparative analyses of the practices of similarly-situated" firms as a way to regulate in an effective, yet minimally intrusive manner. Furthermore, comparative practices analyses could prove critical in enforcing any *Open Internet* Order rules that the Commission might adopt. Comcast and TWC provide particularly useful and informative benchmarks for each other. They are the two largest cable MVPDs and two of the three largest wireline ISPs. Moreover, they use the same network technology, potentially sharpening comparisons of the two companies' technical performance. The merger will make it impossible for the Commission, consumers, or competitors to benchmark the performance of Comcast against that of

³ Israel Decl., ¶ 23.

TWC. Remaining comparators will be much smaller than the merged firm, thereby making comparisons significantly more problematic.

- (8) Dr. Israel claims that scale efficiencies are important and that to achieve the necessary scale, Comcast and TWC must merge.⁴ There are at least two problems with this claim. First, Dr. Israel's claim that economies of scale are significant conflicts with his assertion that Comcast and TWC face strong competition in the provision of broadband to consumers. If Comcast and TWC did face such competition, then either or both could readily expand their scale and capture any scale efficiencies simply by improving their competitive offerings and taking customers from rivals. Second, Dr. Israel's claim about consumer benefits appears at odds with available data. If scale leads to investments that significantly improve services offered to consumers, then one would expect larger cable companies to provide faster Internet access and consumers of larger cable companies to express higher levels of consumer satisfaction. Netflix data, however, suggest that larger cable companies have recently tended to offer slower Internet content delivery. And an analysis of publicly available consumer satisfaction surveys suggests that larger consumer ISPs get *lower* ratings from customers than do smaller consumer ISPs.
- (9) Unless content providers are able to convince consumers to switch their choice of ISP in response to differences among ISPs in their treatment of content providers, each ISP could act as a monopolist over access to its subscribers. Although a content provider could try to persuade its customers (who may or may not be paying for the content) to switch to a different ISP by setting an ISP-specific price, such a strategy is unlikely to be widely tried and still less likely to succeed. Moreover, there are many content providers, and to the extent that each is reluctant to implement ISP-specific pricing but would like to induce users to switch away from an ISP that charges higher access fees, a public-goods problem would arise among the content providers.
- (10) Recently, the subscribers of some consumer ISPs, including Comcast, have experienced significant slowing of content delivery for Netflix. I present an analysis of Cogent and Netflix data that suggests that the significant slowing of content delivery for Netflix was related to an interconnection dispute that resulted in congestion at the interconnection points between Cogent and some large consumer ISPs, including Comcast. It appears that the large consumer ISPs were willing to risk degrading their subscriber experience in order to extract payment for access to their networks. That willingness also supports a finding that such ISPs have market power on the consumer side of the market. Moreover, the episode appears inconsistent with Dr. Israel's claim that because of the structure of interconnections, it would not be possible for an ISP to degrade the delivery of content.⁵

⁴ See, e.g., Israel Decl., ¶¶ 14, 112, 113.

⁵ See, e.g., Israel Decl., ¶ 81.

- (11) The merger of Comcast and TWC is likely to increase the merged firm's bargaining power over content providers. First, although the theoretical literature on the relationship between size and bargaining power is ambiguous, if merging cable companies can choose whether to bargain with content suppliers separately or as a single unit, then one might equally presume that the merged firm would choose to bargain in a way that provides it with the most leverage. In such a case, a merger would never lead to a decrease in the merging parties' bargaining leverage.
- (12) Second, available empirical evidence strongly suggests that a cable company's size increases its bargaining leverage relative to programming suppliers and (to the extent evidence is available) relative to content providers and deliverers. Analyst reports and statements by industry executives, including the parties, and formal empirical studies on the MVPD industry, largely support a widespread industry view that increased size improves the bargaining outcomes for these MVPDs vis-à-vis programmers.⁶
- (13) Third, it appears that larger ISPs showed themselves more willing and able to adopt tough bargaining positions than did smaller ISPs in certain recent disputes and negotiations with Netflix and with Cogent. Larger ISPs were less willing to agree to Netflix's Open Connect offer and less willing to upgrade interconnection ports with Cogent even at the risk of degrading their users' experience. Subsequently, Comcast, Verizon, AT&T, and TWC appear to have reached more lucrative agreements with Netflix than did the smaller ISPs.⁷ Information from Cogent also indicates that larger ISPs are less likely to pay for interconnection and likely to pay less if they do so.⁸ All this suggests that larger ISPs have greater bargaining power than smaller ISPs, as evidenced both by the adoption of tougher tactics and in the financial outcomes.
- (14) Dr. Israel suggests that, even if the merger were to increase the merged party's bargaining power vis-à-vis content providers so that it could charge the content provider for access, this would simply involve a transfer of surplus and would not "imply lower welfare."⁹ I disagree for three reasons. First,

⁶ See evidence cited within section VI.B.1.

⁷ For Comcast, see Justin Bachman, "Comcast Turns Back Cord-Cutting Tide, Adds New Video Customers," *Bloomberg Businessweek*, Apr. 22, 2014, accessed June 3, 2014, <http://www.businessweek.com/articles/2014-04-22/comcast-turns-back-cord-cutting-tide-adds-new-video-customers>. For Verizon, see Jon Brodtkin, "Netflix Pays Verizon for Network Connection to Speed up Video," *Ars Technica*, Apr. 28, 2014, <http://arstechnica.com/tech-policy/2014/04/netflix-and-verizon-reach-interconnection-deal-to-speed-up-video/>. For AT&T, see Jon Brodtkin, "AT&T Might Fix Netflix Problems for its Customers before Verizon Does," *Ars Technica*, July 29, 2014, <http://arstechnica.com/business/2014/07/att-might-fix-netflix-problems-for-its-customers-before-verizon-does/>. For TWC, see James O'Toole, "Faster Netflix Streaming Coming to Time Warner Cable," *CNN Money*, Aug. 20, 2014, <http://money.cnn.com/2014/08/20/technology/netflix-time-warner-cable/>.

⁸ See, e.g., Declaration of Henry (Hank) Kilmer, Vice President of IP Engineering, Cogent Communications Group, Inc., *In re Applications of Comcast Corp. and Time Warner Cable Inc. for Consent to Transfer Control of Licenses and Authorizations*, No. 14-57 (F.C.C. Aug. 25, 2014) [hereinafter Kilmer Decl.], ¶ 26 ("Comcast and TWC, although not Tier 1 networks, have been able to obtain settlement-free peering from certain Tier 1 providers, including Cogent, because of their market power arising from their control of access to the consumers who use them for broadband Internet service.")

⁹ Israel Decl., pg. 77–78.

to the extent that content providers charge the same price regardless of which ISP a consumer uses, increases in access charges by one ISP may not result in higher content prices for customers of only that ISP but rather in higher prices paid by customers of all ISPs, including the rivals of the ISP initiating the price increase. Second, to the extent that charging for access is accomplished by charging for a paid interconnection, the merged firm may have an incentive to artificially degrade the alternative forms of access to the ISP's customers. This incentive is reinforced if the content-provider customer is also a competitive threat to the ISP. Third, unless the pricing of access charges is uniform and transparent, there will be a tendency to price based on ex post willingness to pay, which risks confiscating quasi-rents for innovative and successful content; and of course above-cost uniform pricing is likely to deter efficient trades.

II. Introduction and scope of submission

II.A. Relevant qualifications

- (15) I am Professor of Economics at the University of California, Berkeley, where I am also an Affiliate Professor of Business. I am also a Partner with Bates White, LLC. I received my D.Phil., M.Sc., and B.A. degrees from Oxford University.
- (16) From 2009 to 2012, I served as Director of the Bureau of Economics at the Federal Trade Commission, where I supervised approximately 70 Ph.D.-level economists and reported directly to the Chairman and Commissioners. I was responsible for economic analysis relating to the Commission's broad antitrust and consumer protection portfolios.
- (17) Earlier, in 2000 to 2001, I served as Deputy Assistant Attorney General for Economic Analysis for the Antitrust Division of the US Department of Justice. In this position, which is the chief economist position at the Division, I supervised approximately 50 Ph.D.-level economists and reported directly to the Assistant Attorney General for Antitrust.
- (18) Earlier, in 1996-1997, I served as Chief Economist for the FCC, where I reported directly to the Chairman and Commissioners.
- (19) I have taught undergraduate and Ph.D.-level courses at the University of California at Berkeley and earlier at the Massachusetts Institute of Technology (MIT), and the University of Michigan, on microeconomic theory, industrial organization, and game theory. My teaching experience includes both theoretical and empirical analysis.
- (20) I have published extensively in peer-reviewed academic journals and elsewhere on topics centering on the economics of competition, industrial organization, and innovation.
- (21) I have served on the editorial boards of professional journals, including serving as Editor of the *Journal of Industrial Economics* from 1995–2000 and on the Board of Editors of *Information Economics and Policy* from 2004–2007. I am a Fellow of the Econometric Society, past President of the Industrial Organization Society, and former Board Member for the National Academies' Computer Science and Telecommunications Board.
- (22) I have been retained as a consultant or expert witness in a variety of matters involving telecommunications, intellectual property, antitrust and merger analysis. I have served as a consultant to the Department of Justice (DOJ), Federal Trade Commission (FTC), Canadian Bureau of Competition, Reserve Bank of Australia, and to many private parties. I have testified on matters

related to economic policy in hearings before the Senate Judiciary Committee, FCC, FTC, DOJ, and International Trade Commission (ITC).

II.B. Background and scope of analysis

- (23) Comcast operates both a cable company and NBC-U. As a cable company Comcast provides video, broadband Internet access service, and voice service to a large portion of the United States. TWC also offers video, broadband Internet access service, and voice service in a large area of the United States. Comcast is the largest broadband provider in the United States and TWC is the third largest.¹⁰ In the provision of residential paid TV to US households, Comcast and TWC are the largest and fourth largest in terms of subscribers.¹¹
- (24) As consumer Internet access service providers (consumer ISPs) Comcast and TWC operate in a two-sided market that involves consumers seeking to access content on the Internet on one side and Internet content providers seeking to deliver content to the subscribers of Comcast and TWC on the other side.
- (25) I have been asked by counsel for Cogent Communications, Inc. (“Cogent”) to review the proposed merger of Comcast and TWC and the analysis of the transaction offered by the merging parties’ expert Dr. Israel. I was asked to focus my analysis on the competitive issues that arise in the provision of Internet access on both the consumer and Internet content provider sides of the market. I have not examined whether competitive issues arise in other markets, and so the absence of discussion should not be construed as suggesting that it is my opinion that competitive issues do not arise in those markets.

¹⁰ Q4 2013 cable and telecommunications carrier subscribers, via SNL Kagan, accessed Aug. 8, 2014.

¹¹ Q1 2014 Multichannel Operator Comparison by Market, via SNL Kagan, accessed Aug. 14, 2014.

III. Large cable companies such as Comcast and TWC have market power in the provision of broadband Internet access service to consumers

- (26) Comcast and TWC, like other consumer ISPs, operate in the two-sided market for bringing together content providers and the individual consumers who seek and consume Internet content. ISPs provide value to consumers by enabling them to access Internet content over the ISP's connection—more content and better quality of access increases the value to consumers. ISPs provide value to Internet content providers and other networks by enabling them to communicate with and deliver content to the consumer subscribers of the ISP—more consumer subscribers and higher quality delivery of content increases the value to content providers and other networks. One can think of consumers as input suppliers to the ISP's provision of delivery service, and similarly, connections with content providers and other networks is an input to the provision of Internet access to consumers. Both sides of the market are thus in a real sense customers of the consumer ISP. This is the case even if the content provider uses a transit provider to deliver its traffic to the consumer ISP's network.
- (27) The economics literature on two-sided markets suggests that generally one must consider both sides of the market when doing an antitrust analysis. As the economic literature has explored, the pattern of prices across the two sides as well as the overall level of pricing generally matters in such markets. The principal exception is when there are sufficiently flexible pricing arrangements between the two sides so that any change in the pattern of pricing would be defeated by an adjustment in payments between the two sides themselves. This exception almost certainly does not apply to the case for consumer ISPs. Accordingly, even if one were concerned with the effect of the merger on content and applications providers and other networks, one must also consider the potential competitive effects of the consumer-side of the market. I do so in this section.
- (28) As discussed below, broadband consumers increasingly demand data-intensive and/or bandwidth-intensive content and applications, and in particular streaming video. Although there are several alternative broadband technologies to access Internet content, they differ in their speed, latency, capacity, price and other characteristics. In particular, mobile wireless broadband appears to be a poor substitute for wireline broadband technologies, including cable modem service, fiber-to-the-premises ("FTTP"), and higher speed DSL, for data-intensive and bandwidth-intensive applications such as streaming video, which is among the most popular uses for broadband Internet access. Based on the limitations in mobile wireless broadband that make it inferior for purposes of accessing data-intensive and bandwidth-intensive content (and in particular streaming video),¹² I describe reasons to expect

¹² Kilmer Decl., ¶ 52 ("On one of the new 4G networks, mobile devices are theoretically capable of attaining speeds as high as 300 megabits per second. In practice, download speeds are much slower. Additionally, the cost of the service is significantly higher, with data caps that effectively discourage downloading bandwidth-intensive media.")

that a suitable relevant antitrust product market for analyzing effect of the merger on broadband consumers is no broader than fixed broadband. Additionally, I suggest some more specific tests that FCC staff may have the data to conduct. Assuming this is a relevant market, market shares strongly suggest that cable ISPs have market power, and I am aware of no compelling reason to doubt this inference. The FCC has reported that the vast majority of US households have a choice of at most two fixed wireline broadband providers¹³—the incumbent cable company and the incumbent telephone company. Moreover, in part because it is often difficult for subscribers to switch providers, cable companies have market power not only over their residential subscribers but also over content and applications providers that seek access to those subscribers.

III.A. Consumers of broadband Internet access service increasingly are turning to bandwidth-intensive applications

- (29) As the Commission has previously found, more and more US households are adopting broadband. A survey conducted by the FCC in 2009, as part of the *National Broadband Plan*, found that 65% of American adults used broadband Internet access connections at home,¹⁴ while an October 2012 survey by the NTIA found that 72% of US households had broadband Internet access.¹⁵ Moreover, households with broadband are using it more intensely. The *National Broadband Plan* found, for example, that “[h]ome broadband use has increased from roughly 1 hour per month in 1995, to more than 15 hours per month in 2000, to almost 29 hours per month today, as consumers find more valuable applications and content online.”¹⁶

¹³ National Broadband Plan at 37. The *Plan* went on to state that “the U.S. market structure is relatively unique in that people in most parts of the country have been able to choose from two wireline, facilities-based broadband platforms for many years. Approximately 4% of housing units are in areas with three wireline providers (either DSL or fiber, the cable incumbent and a cable over-builder), 78% are in areas with two wireline providers, about 13% are in areas with a single wireline provider and 5% have no wireline provider.” *Id.* I recognize that the *Plan* is several years old, but I have no reason to believe that the percentages have changed drastically. In any case, the Commission should possess the data to update these statistics. See also *In re Preserving the Open Internet*, Report and Order, 25 FCC Rcd 17905 at ¶ 22 (2010) [hereinafter *Open Internet Order*] (finding that “[t]he risk of market power is highest in markets with few competitors, and most residential end users today have only one or two choices for wireline broadband Internet access service.”); and DOJ, “Voice, Video and Broadband: The Changing Competitive Landscape and Its Impact on Consumers,” Nov. 2008, at 19, available at <http://www.justice.gov/atr/public/reports/239284.pdf> (“The principal competitors in providing residential broadband services continue to be: (1) the incumbent telephone companies, using either DSL over copper or more advanced fiber networks (such as Verizon’s FiOS); and (2) the incumbent cable companies, providing cable modem service over hybrid fiber-coaxial cable.”)

¹⁴ John B. Horrigan, “Broadband Adoption and Use in America: OBI Working Paper No. 1,” available at <http://transition.fcc.gov/national-broadband-plan/broadband-adoption-in-america-paper.pdf>.

¹⁵ National Telecommunications and Information Administration, “Household Broadband Adoption Climbs to 72.4 Percent,” June 6, 2013, available at <http://www.ntia.doc.gov/blog/2013/household-broadband-adoption-climbs-724-percent>.

¹⁶ National Broadband Plan at 16. This was up 5.5 percent from July 2011. *Id.*

According to Sandvine, monthly fixed access average household broadband usage in North America has increased from 32.1 GB in 1H 2012 to 51.4 GB in 1H 2014. See Sandvine, *Global Internet Phenomena Report*, 1H 2012, at 8, available at <https://www.sandvine.com/resources/resource-library.html>; and Sandvine, *Global Internet Phenomena Report*, 1H

- (30) This increase in usage is due in part to a shift to more bandwidth-intensive applications, especially streaming video. The *National Broadband Plan* found:

Both consumers and businesses are turning to applications and content that use video. Video is quickly becoming an important element of many applications, including desktop videoconference calls between family members and online training applications for businesses. Cisco forecasts that video consumption on fixed and mobile networks will grow at over 40% and 120% per year, respectively, through 2013.

User-generated video and entertainment—from sites such as YouTube and Hulu—are a large portion of the total video traffic over broadband connections. Increasingly, video is embedded in traditional websites, such as news sites, and in applications such as teleconferencing. Skype reports that video calls account for over one-third of its total calls, and that number is growing rapidly.¹⁷

- (31) Since the release of the *National Broadband Plan*, the demand for streaming video and real-time applications has continued to increase. According to a Cisco report, between 2012 and 2013, the fastest growing Internet application was online video with a 16 percent year-over-year growth.¹⁸ During the first half of 2014, real-time entertainment (video and music) streamed to the end-user via the Internet represented 64% of the downstream bytes during peak periods from fixed access.¹⁹ This was up from 30% in 2009.²⁰ Furthermore, real-time entertainment usage is ubiquitous in the United States. As reported in the fall of 2011, 96% of broadband subscribers use real-time entertainment each month.²¹ Netflix (34.2%) and YouTube (13.2%) accounted for almost half of peak-period downstream bytes in the first half of 2014.²²

2014, at 5, available at, <https://www.sandvine.com/downloads/general/global-internet-phenomena/2014/1h-2014-global-internet-phenomena-report.pdf>.

¹⁷ National Broadband Plan at 17.

¹⁸ Cisco, “Cisco VNI Service Adoption Forecast, 2013–2018” (white paper, 2014), at 11, available at http://www.cisco.com/c/en/us/solutions/collateral/service-provider/vni-service-adoption-forecast/Cisco_VNI_SA_Forecast_WP.pdf.

¹⁹ Sandvine, *Global Internet Phenomena Report*, 1H 2014, at 5, available at, <https://www.sandvine.com/downloads/general/global-internet-phenomena/2014/1h-2014-global-internet-phenomena-report.pdf>.

²⁰ Sandvine, confidential presentation to Cogent, fall 2011, at 1.

²¹ Sandvine, confidential presentation to Cogent, fall 2011, at 2.

²² Sandvine, *Global Internet Phenomena Report*, 1H 2014, at 6, available at <https://www.sandvine.com/downloads/general/global-internet-phenomena/2014/1h-2014-global-internet-phenomena-report.pdf>. Other major real-time entertainment edge providers include iTunes (3.6%), Amazon Video (1.9%), and Hulu (1.7%) for downstream traffic.

- (32) Netflix had 44 million subscribers worldwide as of 2014. Those subscribers consumed 1 billion hours of streamed TV shows and movies per month,²³ or about 23 hours of Internet video streaming per month per subscriber.²⁴

III.B. Broadband Internet access technologies differ significantly in their characteristics and suitability for accessing real-time entertainment, such as streaming video

- (33) There are a number of different technologies that provide broadband access to the Internet, including mobile and fixed wireless technologies, fixed wireline technologies and satellite. These technologies vary, however, in their upload and download speeds, their performance characteristics (such as latency, jitter, and congestability),²⁵ and in the terms and conditions under which they are offered. Because of these differences, certain technologies are far superior for accessing streaming video and other data-intensive and bandwidth-intensive content and applications.
- (34) Streaming video requires relatively fast, and consistently fast, download speeds and involves downloading significant amounts of data. For example, Netflix recommends that subscribers use an Internet connection that ensures at least 3 Mbps downstream speeds for standard definition viewing and 5 Mbps for high-definition viewing; for Ultra HD 4K content, Netflix recommends 25 Mbps.²⁶ Similarly, online gaming requires not only fast upload and download speeds but also low latency. And video conferencing requires low latency.
- (35) Below, I discuss how the various technologies differ in terms of speed, latency, capacity and cost, and explain why mobile and satellite broadband technologies are inferior when it comes to accessing streaming video and other bandwidth-intensive content and applications.^{27,28}

²³ Mark Prigg, “Is YOUR Internet Provider Slowing Down Netflix? Comcast and Verizon Customers Claim Service is ‘Unusable,’” Mail Online, Feb. 12, 2014, <http://www.dailymail.co.uk/sciencetech/article-2557897/Is-Netflix-slowed-internet-providers-Comcast-Verizon-customers-claim-service-unusable-sites-work-fine.html>.

²⁴ Depending on the data usage setting that the end-user chooses, one hour of Netflix usage can consume 0.3 GB (low quality), 0.7 GB (medium), or 3 GB (high quality). Three-dimensional content and 4K content require even more downstream bytes (4.7 GB and 7 GB, respectively). See Netflix, “How Can I Control How Much Data Netflix Uses?,” accessed May 20, 2014, <https://help.netflix.com/en/node/87>.

²⁵ Latency is the time it takes for a data packet to travel from one point to another in a network. See FCC, *2014 Measuring Broadband America: A report on Consumer Fixed Broadband Performance in the U.S.*, 2014, at 35, available at <https://www.fcc.gov/reports/measuring-broadband-america-2014>.

Jitter is a delay in receiving a voice data packet which can affect the quality of the data. See Techopedia, “Jitter (VoIP),” accessed Aug. 12, 2014, <http://www.techopedia.com/definition/3041/jitter-voip-voice-over-internet-protocol-voip>.

²⁶ See Netflix, “Internet Connection Speed Recommendations,” accessed May 20, 2014, <https://help.netflix.com/en/node/306>.

²⁷ See, e.g., Adrienne Jeffries, “The Worst Company in America,” Verge, Aug. 19, 2014, <http://www.theverge.com/2014/8/19/6004131/comcast-the-worst-company-in-america> (“While they don’t compete with each other, cable companies do face competition from satellite, DSL, and 3G and 4G wireless providers. Unfortunately

III.B.1. Fixed wireline technologies generally offer consistently faster speeds than mobile wireless

- (36) According to the FCC’s *2014 Measuring Broadband America Report*, certain fixed-line broadband technologies are significantly faster than others. FTTP broadband was the fastest broadband technology during peak weekday hours, with average download speeds of 41.4 Mbps and average upload speeds of 25.9 Mbps. Cable technologies had an average download speed of 25.5 Mbps and an upload speed of 4.5 Mbps. Satellite and DSL had average download speeds of 16.7 Mbps and 7.7 Mbps, respectively. The average upload speeds of satellite and DSL were 4.1 Mbps and 0.9 Mbps, respectively.²⁹ With respect to the ability of these fixed wireline technologies to stream video, the Report states:

The results published in this Report suggest that video streaming will work across all technologies tested, though the quality of the video that can be streamed will depend upon the speed. For example, standard definition video is currently commonly transmitted at speeds from 1 Mbps to 2 Mbps. High quality video can demand faster speeds, with full HD (1080p) demanding 5 Mbps or more for a single stream.³⁰

- (37) The quality of the video streaming is a particular issue for aDSL technology, since, depending on the technology and the length of the copper loop, download speeds can be quite low. According to FCC Form 477 data, as of June 30, 2013, only 51.9% of the approximately 31 million total aDSL connections had advertised download speeds of at least 3 Mbps down and 768 kbps up.³¹

for customers, those technologies are far inferior. Satellite television is unreliable in bad weather, and unavailable in areas blocked by trees or buildings. Meanwhile, existing DSL and wireless services are frustratingly slow for modern internet uses like streaming video, transferring files, and loading web applications for professionals.”)

²⁸ Fixed wireless appears less widely deployed and less popular. According to the Form 477 data, fixed wireless represents only about 0.5% of fixed broadband connections with speeds of at least 3 Mbps download and 768 kbps upload. See Figure 4.

Fixed wireless also suffers from certain limitations such as requiring line-of-sight access between the subscriber and the ground station and being adversely affected by weather conditions, such as rain and fog. In addition the cost per Mbps of bandwidth tends to be higher. See Bradley Mitchel, “What is Fixed Wireless Broadband Internet Access,” accessed Aug. 18, 2014, <http://compnetworking.about.com/od/wirelessinternet/f/fixed-wireless.htm>.

²⁹ FCC, data on statistical averages, Sept. 2013, available at <http://data.fcc.gov/download/measuring-broadband-america/2014/statistical-averages-Sept-2013-v12.xlsx>.

³⁰ FCC, *2014 Measuring Broadband America: A report on Consumer Fixed Broadband Performance in the U.S.*, 2014, at 17, available at <https://www.fcc.gov/reports/measuring-broadband-america-2014>.

³¹ FCC, *Internet Access Services: Status as of June 30, 2013*, June 2014, at Table 5 and Table 7, available at https://apps.fcc.gov/edocs_public/attachmatch/DOC-327829A1.pdf. The *2014 Measuring Broadband America Fixed Broadband Report* indicated that AT&T, Centurylink, Frontier, Qwest, Verizon and Windstream all offered DSL service in certain parts of their service territories with advertized download speeds of 3 Mbps or less. See FCC, *2014 Measuring Broadband America: A report on Consumer Fixed Broadband Performance in the U.S.*, 2014, at 36, available at <https://www.fcc.gov/reports/measuring-broadband-america-2014>.

- (38) Although mobile wireless broadband networks now have download speeds capable of transmitting streaming video, realized speeds are much more variable.³² For example, the speed may vary depending how far the customer is from a cell tower, how many customers are using the tower at the same time, and on whether there are buildings or terrain that obstruct the delivery of the signal from the tower to the device.³³ As a result, actual speeds are frequently far lower than peak or average speeds. According to a separate 2013 report by the FCC, mobile wireless only had a median download speed of 1.7 Mbps for a 4 MB file.³⁴ Because of mobile broadband’s technical limitations, in many circumstances it will be unable to deliver high-quality streaming video.

III.B.2. Satellite broadband suffers from higher latency and other problems compared with wireline technologies

- (39) Speed is not the only relevant measure of Internet access service quality. Excessive latency can also adversely affect user experiences, especially for certain applications like online gaming, Voice-Over - IP (“VOIP”), and video conferencing. Skype recommends that latency be less than 200ms and that the jitter (difference between maximum latency and minimum latency) be less than 10ms for best performance results.³⁵ As with average speeds, the latencies reported by the FCC in the *2014 Measuring Broadband America Report* vary with technology. Fiber and cable technologies experience the lowest average latencies during peak periods, with 24 ms and 30 ms, respectively. DSL reported latency is 48 ms, while satellite technologies experienced the highest reported latency with 671 ms.³⁶ Satellite connections that require more than one hop may see further increased latency. Excessive latency can either degrade or make unworkable certain applications like online gaming, VOIP, and Citrix.³⁷ As the Commission recently explained:

[L]atency [of satellite broadband] has been an order of magnitude greater than with terrestrial broadband technologies. Communicating with a geosynchronous satellite orbiting the earth at a distance of greater than 36,000 km results in a round trip

³² See, e.g., Kilmer Decl., ¶ 52 (“On one of the new 4G networks, mobile devices are theoretically capable of attaining speeds as high as 300 megabits per second. In practice, download speeds are much slower.”); Nathan Eddy, “AT&T Tops Verizon in 4G LTE Speed Tests,” eWeek, Mar. 12, 2013, *available at* <http://www.eweek.com/networking/atandt-tops-verizon-in-4g-lte-speed-tests/>.

³³ National Broadband Plan at 22.

³⁴ FCC, *16th Mobile Competition Report*, adopted Mar. 19, 2013, ¶ 298, *available at* https://apps.fcc.gov/edocs_public/attachmatch/FCC-13-34A1.pdf.

³⁵ See Skype, “Skype Connect Requirements Guide,” 2011, *available at* <http://download.skype.com/share/business/guides/skype-connect-requirements-guide.pdf>.

³⁶ FCC, *2014 Measuring Broadband America: A report on Consumer Fixed Broadband Performance in the U.S.*, 2014, at 35, *available at* <https://www.fcc.gov/reports/measuring-broadband-america-2014>.

³⁷ See Kilmer Decl., ¶ 51 (“Satellite is capable of delivering speeds up to 12 megabits per second, but latency is approximately twenty times worse than non-satellite services. Services such as VoIP require low latency connectivity to function properly and, therefore, satellite based connectivity is not generally considered an option for many users.”); High Speed Sat, “Satellite Signal Latency,” accessed June 19, 2014, <http://www.highspeedsat.com/latency.php>.

latency of about 500 ms. The necessary signaling between the set-top box and the satellite controller, to request assignment of a communication channel, can double this to over 1000 ms, which would preclude use of many latency-sensitive services. In contrast, the maximum average latency found in our surveys for terrestrial technologies is less than 70 ms.³⁸

- (40) In addition to latency, satellite Internet also can be affected by severe weather conditions. For example, snow on the dish results in poor reception and slowed Internet speed. Moderate to strong winds can cause the dish to be misaligned. And heavy cloud coverage may result in dropped reception.³⁹

III.B.3. Mobile wireless and satellite broadband technologies have lower capacity than fixed wireline technologies, making them more costly for data-intensive content and applications

- (41) Because mobile wireless and satellite broadband, unlike wireline broadband technologies, rely on scarce radio spectrum, which must be shared by broadband users, these technologies have lower capacity than wireline technologies and are subject to congestion problems, which slow broadband speeds. As a result, broadband providers using satellite and mobile wireless technologies have tended to impose significantly lower data caps in their retail offerings,⁴⁰ and to impose overage charges or throttle service if a subscriber exceeds his cap.
- (42) These data caps limit usage of mobile wireless and satellite broadband compared with wireline broadband, and they discourage the use of data-intensive applications. In fact, the average data usage for fixed broadband was over ten times that for mobile broadband, while median usage was over 200 times larger for fixed broadband.⁴¹ According to Sandvine’s 1H 2014 *Global Internet Phenomena*

³⁸ FCC, *2014 Measuring Broadband America: A report on Consumer Fixed Broadband Performance in the U.S.*, 2014, at 18, available at <https://www.fcc.gov/reports/measuring-broadband-america-2014> (footnotes omitted).

³⁹ Adrienne Jeffries, “The Worst Company in America,” *Verge*, Aug. 19, 2014, <http://www.theverge.com/2014/8/19/6004131/comcast-the-worst-company-in-america>; Globalcom, “Weather Outages and Satellite Internet Dish Location,” accessed July 31, 2014 <http://www.globalcomsatphone.com/hughesnet/weather.html>.

⁴⁰ Although AT&T and Verizon previously offered unlimited data plans, they withdrew them as average per customer data consumption increased. See FCC, *16th Mobile Competition Report*, adopted Mar. 19, 2013, ¶¶ 138–39, available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-13-34A1.pdf. AT&T and Verizon allowed customers on those plans to be grandfathered, but it appears that they may throttle speeds for certain customers. See Alina Selyukh and Marina Lopes, “After Verizon, U.S. FCC Quizzing Other Carriers on Data Management,” *Reuters*, Aug. 8, 2014, <http://www.reuters.com/article/2014/08/08/us-verizon-fcc-mobilephone-idUSKBN0G81YB20140808>. Sprint and T-Mobile continue to offer unlimited plans, but Sprint prohibits certain high-data usage applications, while T-Mobile throttles speed if a customer’s usage exceeds a certain level in a single month. Sprint, “Terms & Conditions” (effective July 1, 2013), accessed Aug. 1, 2014, http://shop2.sprint.com/en/legal/os_general_terms_conditions_popup.shtml; T-Mobile, “About T-Mobile: Company Information,” accessed Aug. 1, 2014, http://www.tmobile.com/company/companyinfo.aspx?tp=Abt_Tab_ConsumerInfo&tsp=Abt_Sub_InternetServices.

⁴¹ FCC, data on statistical averages, Sept. 2013, available at <http://data.fcc.gov/download/measuring-broadband-america/2014/statistical-averages-Sept-2013-v12.xlsx>.

Report, which measures mean and median broadband usage in North America for fixed access and mobile access, the mean broadband aggregate usage (downstream and upstream) was reported as 51.4 GB for fixed access broadband and 465.2 MB (0.45 GB) for mobile access.⁴² The median broadband aggregate usage was 19.4 GB for fixed access and 101.7 MB (0.10 GB) for mobile access.⁴³

- (43) As the usage statistics suggest, mobile wireless broadband is typically not used in the same way as wireline broadband. Indeed, most mobile contracts either restrict usage (either by prohibiting certain content and applications or by throttling speed) or price it in such a way that using it to replace typical wireline usage would be exorbitantly expensive.⁴⁴ Based on the Sandvine 1H 2014 average monthly fixed access broadband statistics, in order to substitute from wireline, the average person would need a monthly plan with more than 50 GB of data.
- (44) Figure 1 provides a comparison of broadband costs across carriers. For 50 GB of data, Verizon Wireless charges \$375 per month, while AT&T charges \$335. In contrast, Comcast's highest speed Internet, Extreme 150, is offered for \$89.99 per month.⁴⁵ Wireless providers Sprint and T-Mobile offer unlimited data plans at comparable rates to Comcast, but restrictions may apply and throttling may occur.⁴⁶
- (45) Satellite carriers also significantly limit usage, especially during peak hours. For example, HughesNet's largest data plan includes only 20 GB of "Anytime Downloads," and 20 GB of "Bonus

⁴² Sandvine, *Global Internet Phenomena Report*, 1H 2014, at 5 and 8, available at <https://www.sandvine.com/downloads/general/global-internet-phenomena/2014/1h-2014-global-internet-phenomena-report.pdf>.

⁴³ Sandvine, *Global Internet Phenomena Report*, 1H 2014, at 5 and 8, available at <https://www.sandvine.com/downloads/general/global-internet-phenomena/2014/1h-2014-global-internet-phenomena-report.pdf>.

⁴⁴ The two largest wireless providers, AT&T and Verizon, cap data usage at 50 GB and 100 GB, respectively, and these plans are very expensive. Wireless providers also charge customers high overage costs and may throttle usage. For example, Verizon and AT&T charge \$15/GB for mobile data overages for plans with greater than 2GB of data. AT&T charges \$10/GB for device data overages. *See* AT&T, "Mobile Share Value Pricing," accessed Aug. 7, 2014, <http://www.att.com/shop/wireless/data-plans.html#fbid=oBgc5UZ5fbV>; Verizon, "More Everything Plan: For Voice & Data Pricing," accessed Aug. 7, 2014, <http://www.verizonwireless.com/wcms/consumer/shop/shop-data-plans/more-everything.html>.

⁴⁵ Comcast, "XFINITY Internet," accessed June 12, 2014, <http://www.comcast.com/internet-service.html>.

⁴⁶ For example, Sprint offers an unlimited plan for \$75/month, but the typical high-usage applications, including the continuous streaming of videos, downloading of files or on line gaming, fall within what Sprint defines as "prohibited data uses" in its terms and conditions. *See* Sprint, "Terms & Conditions" (effective July 1, 2013), accessed Aug. 1, 2014, http://shop2.sprint.com/en/legal/os_general_terms_conditions_popup.shtml. Similarly, under T-Mobile's contract terms, unlimited plans are subject to throttling if total usage exceeds 5GBs/month. *See* T-Mobile, "About T-Mobile: Company Information," accessed Aug. 1, 2014, http://www.tmobile.com/company/companyinfo.aspx?tp=Abt_Tab_ConsumerInfo&tsp=Abt_Sub_InternetServices. Additionally, Verizon recently announced that it will begin throttling "[t]he top 5 percent of data users" beginning in October. These subscribers currently exceed 4.7GB of data. *See* Chris Welsh, "Verizon Response to FCC's Throttling Concerns: Everyone's Doing It," *Verge*, Aug. 4, 2014, <http://www.theverge.com/2014/8/4/5968481/verizon-response-to-fcc-throttling-letter>.

Bytes” that can only be used during off-peak hours between 2 am and 8 am.⁴⁷ HughesNet throttles a subscriber’s usage if he or she exceeds the cap.⁴⁸

⁴⁷ Hughes Network Systems, “Plans and Promotions,” accessed June 12, 2014, <http://www.hughesnet.com/?page=Plans-Pricing#>.

⁴⁸ HughesNet, “HughesNet Gen4 Fair Access Policy,” accessed Aug. 14, 2014, <http://legal.hughesnet.com/FairAccessPolicyGen4.cfm>.

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Figure 1. Monthly costs for broadband plans

Carrier	Plan	Plan costs					Marginal costs (when plan limits are exceeded) ^[P]		
		15–25 GB	30 GB	40 GB	50 GB	100 GB	Unlimited	One hour SD video	One hour HD video
Verizon wireless	Mobile data ^[A]	\$130.00–\$150.00	\$225.00	\$300.00	\$375.00	\$750.00	NA	\$15.00	\$45.00
	Device data ^[B]	\$90.00–\$110.00	\$185.00	\$260.00	\$335.00	\$710.00	NA	\$15.00	\$45.00
AT&T wireless	Mobile data ^[C]	\$130.00–\$150.00	\$225.00	\$300.00	\$375.00	NA	NA	\$15.00	\$45.00
	Device data ^[D]	NA	NA	NA	NA	NA	NA	\$10.00	\$30.00
Sprint ^[E]	Mobile data	\$75.00 with talk/text ^[F]						NA	NA
T-Mobile ^[G]	Mobile data	\$80.00 with talk/text ^[H]						NA	NA
Dish Network ^[I]	Internet only	\$79.99 ^[J]	NA	NA	NA	NA	NA	NA	NA
Exede Internet ^[K]	Internet only	\$79.99–\$129.99 ^[L]	NA	NA	NA	NA	NA	NA	NA
HughesNet ^[M]	Internet only	\$79.99–\$129.99 ^[N]	NA	NA	NA	NA	NA	NA	NA
Comcast XFINITY ^[O]	Internet only	\$39.99–\$89.99 depending on speed						NA	NA

Source: [A] Verizon, "More Everything Plan: For Voice & Data Pricing," accessed Aug. 7, 2014, <http://www.verizonwireless.com/wcms/consumer/shop/shop-data-plans/more-everything.html>; [B] Verizon, "More Everything Plan: For Data Only Pricing," accessed Aug. 7, 2014, <http://www.verizonwireless.com/wcms/consumer/shop/shop-data-plans/more-everything.html>; [C] AT&T, "Mobile Share Value Pricing," accessed Aug. 7, 2014, <http://www.att.com/shop/wireless/data-plans.html#bid=oBg5UZ5fbV>; [D] AT&T, "Wireless Data Plans," accessed Aug. 7, 2014, <http://www.att.com/shop/wireless/plans/dataplans.html>; [E] Sprint, "Family Plan: Service Add-ons," accessed Aug. 7, 2014, <http://www.sprint.com/landings/unlimitedplans/?INTNAV=ATG:HE:UnlimitedMyWay>; [F] Sprint offers an unlimited plan for \$75/month, but the typical high-usage applications, including the continuous streaming of videos, downloading of files or on line gaming, fall within what Sprint defines as "prohibited data uses" in its terms and conditions. See Sprint, "Terms & Conditions" (effective July 1, 2013), accessed Aug. 1, 2014, http://shop2.sprint.com/en/legal/os_general_terms_conditions_popup.shtml; [G] T-Mobile, "Simple Choice Plan," accessed Aug. 7, 2014, <http://www.t-mobile.com/cell-phone-plans/individual.html>; [H] Under T-Mobile's contract terms, unlimited plans are subject to throttling if total usage exceeds 5GBs/month. See T-Mobile, "About T-Mobile: Company Information," accessed Aug. 1, 2014, http://www.t-mobile.com/company/companyinfo.aspx?tp=Abt_Tab_ConsumerInfo&tsp=Abt_Sub_InternetServices; [I] Dish Network, "Choose Your Satellite Internet Package," accessed Aug. 7, 2014, <http://www.dish.com/entertainment/internet-phone/satellite-internet/>; [J] Under Dish Network's contract terms, plans are subject to throttling if total usage exceeds the monthly limit which include Off-Peak Bonus Data only usable from 2 a.m. to 8 a.m.. See DishNet, "DishNet Satellite - Need to Know & FAQs," accessed Aug. 14, 2014, <http://www.dish.com/entertainment/internet-phone/satellite-internet/>; [K] Exede, "Satellite Internet Packages & Pricing, 20005," accessed Aug. 7, 2014, <http://www.exede.com/internet-packages-pricing/service-availability?zip=20005>; [L] Usage incurred during the period 12 am to 5 am is not counted against the cap. If Exede customers go over their data usage, Exede will "significantly slow and/or restrict your service until the end of your monthly measurement period." Exede Internet, "Data Allowance Policy FAQ," accessed Aug. 14, 2014, [available at data-allowance-policy-faq](http://www.exede.com/data-allowance-policy-faq); [M] Hughes Network Systems, "Plans and Promotions," accessed Aug. 7, 2014, <http://www.hughesnet.com/?page=Plans-Pricing>; [N] HughesNet provides its customers with Bonus Bytes that can only be used between the hours of 2 a.m. and 8 a.m., and HughesNet also reduces speed if consumers exceed their data allowance. HughesNet, "HughesNet Gen4 Fair Access Policy," accessed August 14, 2014, <http://legal.hughesnet.com/FairAccessPolicyGen4.cfm>; [O] Comcast, "XFINITY Internet," accessed Aug. 7, 2014, <http://www.comcast.com/internet-service.html>; [P] Netflix reports that a Standard Definition movie uses 0.7 GB of data per hour. An HD movie uses 3 GB per hour and Ultra HD 4K uses 7 GB per hour. See Netflix, "How Can I Control How Much Data Netflix Uses," accessed Aug. 14, 2014, <https://help.netflix.com/en/node/87>.

- (46) Although major cable and telecom providers may include a data cap in the terms and conditions of their plans, these caps are much higher and generally greatly exceed average fixed broadband usage.⁴⁹ For example, Comcast rolled out a 250 GB monthly cap in October 2008,⁵⁰ and in May 2012, Comcast announced that it would no longer enforce its “250 GB usage allowance” and that it would “trial and launch new data usage plans.”^{51,52} AT&T U-Verse caps data at 150 GB and 250 GB depending on the plan, with a \$10 overcharge per additional 50 GB. According to AT&T, less than 2% of its customer base goes over the lower 150 GB limit.⁵³
- (47) The two largest wireless networks charge subscribers for overages at much higher prices than (for instance) the U-Verse overage rate just cited. As shown in Figure 2, Verizon and AT&T charge \$15/GB (arithmetically, \$750 per additional 50GB) for mobile data overages for plans with greater than 2GB of data.⁵⁴ AT&T charges \$10/GB for device data overages. Therefore, the marginal cost of viewing a one hour standard definition movie is \$10-\$15 for a Verizon Wireless or AT&T customer that exceeded his/her data cap. This charge increases to \$30-\$45 if viewing a one hour high definition movie.⁵⁵ Even higher rates can apply for lower mobile and device data plans. The maximum device data plan on Sprint is 12 GB, with an overage charge of \$0.05 per MB of data (arithmetically, \$50 per GB or \$2,500 per 50GB).⁵⁶ Similarly, the maximum device data plan on T-Mobile is 11 GB. Although there is no overage charge, T-Mobile will throttle the speed once a customer exceeds the cap.

⁴⁹ Jacob Minne, “Data Caps: How ISPs are Stunting the Growth of Online Video Distributors and what Regulators can do about it; Internet Service Providers,” *Federal Communications Law Journal* 65, no. 2 (2013): 233–60.

⁵⁰ Comcast, “Announcement Regarding an Amendment to our Acceptable Use Policy,” accessed June 10, 2014, <http://xfinity.comcast.net/terms/network/amendment/>.

⁵¹ Comcast, “Frequently Asked Questions: Does this mean you’re going to stop cutting people off who exceed your allowance?,” accessed June 10, 2014, <http://customer.comcast.com/help-and-support/internet/data-usage-exceeding-the-allowance>.

⁵² In the trial markets, Comcast created monthly data usage plans “where any usage which exceeds the monthly data plan amount is subject to an additional charge.” The data caps increased to 300 GB in most trial markets; lower data tiers are now available in some trial markets. See Comcast XFINITY, “Frequently Asked Questions: Does this mean you’re going to stop cutting people off who exceed your allowance?” accessed June 10, 2014, <http://customer.comcast.com/help-and-support/internet/data-usage-exceeding-the-allowance>. In non-trial markets, Comcast continues to contact excessive users where the “vast majority of customers we ask to curb usage do so voluntarily.” See Comcast XFINITY, “Announcement Regarding an Amendment to our Acceptable Use Policy,” accessed June 10, 2014, <http://xfinity.comcast.net/terms/network/amendment/>.

⁵³ AT&T, “Broadband Usage FAQs,” accessed June 4, 2014, <http://www.att.com/esupport/article.jsp?sid=KB409045&cv=801#fbid=N9ti5ONt-7J>.

⁵⁴ The FCC recently wrote to Verizon asking about reports that it would throttle speeds of customers having grandfathered unlimited data plans. Subsequently the Commission wrote other mobile carriers asking about their throttling policies. See Alina Selyukh and Marina Lopes, “After Verizon, U.S. FCC Quizzing Other Carriers on Data Management,” Reuters, Aug. 8, 2014, <http://www.reuters.com/article/2014/08/08/us-verizon-fcc-mobilephone-idUSKBN0G81YB20140808>.

⁵⁵ Netflix reports that a standard definition movie uses 0.7 GB of data per hour. An HD movie uses 3 GB per hour and Ultra HD 4K uses 7 GB per hour. See Netflix, “How Can I Control How Much Data Netflix Uses,” accessed Aug. 14, 2014, <https://help.netflix.com/en/node/87>.

⁵⁶ Verizon and AT&T charge for an additional GB as soon as a customer exceeds his or her cap. Sprint, in contrast, only charges for each MB that a customer exceeds his or her cap.

Figure 2. Overage costs for mobile and device data plans

Carrier	Plan	Plans greater than 2 GB
Verizon	Mobile data	\$15/GB
	Device data	\$15/GB
AT&T	Mobile data	\$15/GB
	Device data	\$10/GB
Sprint	Device data	\$0.05 per MB for data only plans \$0.015 per MB for non-unlimited mobile data plans
T-Mobile	Device data	No overage charges for data only plans

Source: AT&T, "Mobile Share Value Pricing," accessed Aug. 7, 2014, <http://www.att.com/shop/wireless/data-plans.html#fbid=oBgc5UZ5fbV>; Verizon, "More Everything Plan: For Voice & Data Pricing," accessed Aug. 7, 2014, <http://www.verizonwireless.com/wcms/consumer/shop/shop-data-plans/more-everything.html>; Sprint, "Family Plan: Pricing Information and Terms," accessed Aug. 19, 2014, http://shop.sprint.com/mysprint/shop/plan_details.jsp?tabId=plnTab6620001&planCatId=pln813001cat&planFamilyType=&flow=AAL&showDetailsTab=true; T-Mobile, "About T-Mobile: Company Information," accessed Aug. 1, 2014, http://www.t-mobile.com/company/companyinfo.aspx?tp=Abt_Tab_ConsumerInfo&tsp=Abt_Sub_InternetServices.

Note: Sprint and T-Mobile have unlimited data plans for their smart phones, but as discussed above they either limit the content and applications that can be downloaded or throttle download speeds if usage exceeds certain specified levels. See n. 40.

- (48) In short, the various broadband technologies differ substantially on a number of dimensions: quality (speed, latency, jitter, and robustness to weather), price (base price, data caps, and overage charges), and available bundling. Figure 3 provides an overview of broadband technologies across some of these dimensions.

Figure 3. Overview of broadband technologies during peak weekday hours, average statistics

Technology	Download speed	Usage	Latency	Jitter
Fiber ^[A]	41.35 Mbps	13.49 GB	24.07 ms	2.51 ms
Cable ^[A]	25.48 Mbps	14.93 GB	31.77 ms	1.63 ms
Satellite ^[A]	16.66 Mbps	NA	671.10 ms	10.70 ms
DSL ^[A]	7.67 Mbps	8.77 GB	48.96 ms	5.07 ms
Wireless ^[B]	1.7 Mbps	NA	NA	NA

Source: [A] FCC, data on statistical averages, Sept. 2013, available at <http://data.fcc.gov/download/measuring-broadband-america/2014/statistical-averages-Sept-2013-v12.xlsx>; [B] FCC, *16th Mobile Competition Report*, adopted Mar. 19, 2013, ¶ 298, available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-13-34A1.pdf.

III.C. There is likely a relevant market no broader than fixed broadband technologies

- (49) I conclude that mobile wireless broadband is not a close substitute for fixed broadband for the (increasingly) many consumers who use broadband to download data- and bandwidth- intensive

content and applications, like video streaming.⁵⁷ The slower, and more variable, speed of mobile wireless broadband, the significantly lower data caps, and the high per GB cost make it unsuitable to use for downloading significant video streaming. Clearly many consumers have both fixed broadband and mobile connections, but as everyday experience indicates and the data described corroborates, consumers use them very differently. In particular mobile wireless customers download much less data on their mobile devices. The prevalence of this pattern, and the pricing, indicate that it would be far-fetched to suppose that many consumers view fixed and mobile broadband as substitutes in the sense that a small but significant increase in price for fixed broadband would induce them to abandon fixed broadband in favor of using their mobile connection exclusively.

- (50) Moreover, industry experts do not view fixed broadband and mobile wireless broadband as substitutes. Verizon Wireless' CEO Dan Mead, after noting that: "We [Verizon] know both sides of that [LTE and wireline] pretty well," observed that Comcast's claim that LTE and wireline compete "may be a little bit of a stretch, and the economics are much different."⁵⁸ Furthermore, the fact that the Commission and the DOJ permitted Verizon Wireless and Comcast to cross-sell their services (except in areas where both Comcast and Verizon offered cable broadband and FiOS respectively) suggests that both agencies recognize that wireline broadband and mobile wireless broadband are not close substitutes.⁵⁹ Similarly, the fact that the Commission reports separately on the status of fixed broadband deployment and mobile deployment,⁶⁰ and the fact that the Commission does not apply the same speed test methodology for both technologies further suggests that the Commission recognizes that the technologies are not close substitutes.⁶¹
- (51) Although I do not have the data to undertake a critical loss analysis, I thus believe that, if the Commission were to do so, it would confirm that there is a relevant antitrust market that captures the principal constraints on cable ISPs and that that relevant market is no broader than fixed broadband.⁶²

⁵⁷ FCC, "Glossary of Terms Used in FCC Form 477 Instructions," at 2, *available at* <http://transition.fcc.gov/form477/477glossary.pdf>. (A connection with information-transfer rates above 200 kbps in at least one direction that is . . . delivering Internet access service at the residential or non-residential premises of the end user. . . .")

⁵⁸ Chris Ziegler, "Comcast's Claim that LTE Competes with Cable Modems is 'A Little Bit of a Stretch,' Says Verizon Wireless CEO," *Verge*, Aug. 4, 2014, <http://www.theverge.com/2014/8/4/5968545/comcasts-claim-that-lte-competes-with-cable-modems-is-a-little-bit-of-a-stretch>.

⁵⁹ Memorandum Opinion and Order and Declaratory Ruling, *In re Applications of Celco Partnership*, No. 12-95 (F.C.C. 2012), ¶ 18.

⁶⁰ *See, e.g.*, Eighth Broadband Progress Notice of Inquiry, *In re Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, No. 11-124 (F.C.C. 2011), ¶¶ 59–60.

⁶¹ *See* FCC, 2014 *Measuring Broadband America: A Report on Consumer Fixed Broadband Performance in the U.S.*, 2014, *available at* <https://www.fcc.gov/reports/measuring-broadband-america-2014>.

⁶² *See* Daniel P. O'Brien and Abraham L. Wickelgren, "A Critical Analysis of Critical Loss Analysis," *Antitrust Law Journal* 71 (2003): 161–84; Michael Katz and Carl Shapiro, "Critical Loss: Let's Tell the Whole Story," *Antitrust* (2003): 49–56. Some criticisms and extensions are discussed in Joseph Farrell and Carl Shapiro, "Improving Critical

III.D. If fixed broadband is a relevant product market, market shares suggest that cable has market power over consumers

III.D.1. Subscriber shares based on FCC Form 477 data

- (52) If we take fixed broadband Internet access service as the relevant product market, then I would expect that the incumbent cable company and incumbent telephone company together would have a dominant combined share in local geographic markets and that the incumbent cable companies, and Comcast and TWC in particular, are likely to have sufficiently large individual shares for the Commission to presume that they have market power over consumers.⁶³ This expectation is based in part on available aggregate data such as those given in Figure 4, which report the number of subscribers with at least 3 Mbps download and 768 kbps upload. These data indicate that on a national basis, cable had approximately 65% of fixed broadband subscribers and DSL providers (predominantly incumbent telephone companies) had an additional 23%. Satellite represented approximately 1% of fixed-line connections. One would expect that satellite's penetration is highest among households that lack fiber, high-speed DSL, and/or cable options, indicating that even fewer than 1% of households with such options chose satellite.⁶⁴ Fixed wireless also has an extremely small share (less than 1%).

Loss Analysis," *Antitrust Source*, (2008): 1–17.

⁶³ The FCC's *National Broadband Plan* found that that approximately 96% of the population has at most two wireline providers." See *National Broadband Plan* at 37. The *Plan* went on to state that "the U.S. market structure is relatively unique in that people in most parts of the country have been able to choose from two wireline, facilities-based broadband platforms for many years. Approximately 4% of housing units are in areas with three wireline providers (either DSL or fiber, the cable incumbent and a cable over-builder), 78% are in areas with two wireline providers, about 13% are in areas with a single wireline provider and 5% have no wireline provider." *Id.* In addition, in the *Open Internet Order*, the Commission concluded that "[t]he risk of market power is highest in markets with few competitors, and most residential end users today have only one or two choices for wireline broadband Internet access service." *Open Internet Order*, ¶ 22. I recognize that the *Plan* and the *Open Internet Order* are several years old, but I have no reason to believe that the percentages have changed drastically. In any case, the Commission should possess the data to update these statistics.

See also DOJ, "Voice, Video and Broadband: The Changing Competitive Landscape and Its Impact on Consumers," Nov. 2008, at 19, available at <http://www.justice.gov/atr/public/reports/239284.pdf> ("The principal competitors in providing residential broadband services continue to be: (1) the incumbent telephone companies, using either DSL over copper or more advanced fiber networks (such as Verizon's FiOS); and (2) the incumbent cable companies, providing cable modem service over hybrid fiber-coaxial cable.")

⁶⁴ According to the FCC, there were 18 million Americans in 2011 living in rural areas "who currently have no access to robust broadband infrastructure." See FCC, "Connect America Fund (CAF)," accessed Aug. 12, 2014, <http://www.fcc.gov/encyclopedia/connecting-america>.

Figure 4. Subscribers with connections at least 3 Mbps downstream and 768 kbps upstream by technology (in thousands)

Technology	2009	2010	2011	2012	2013
Cable modem	23,958	30,616	34,113	37,798	46,014
aDSL	5,614	6,275	8,909	12,875	16,029
FTTP	3,333	4,192	5,188	6,001	6,989
Satellite	NA	NA	NA	87	791
Fixed wireless	64	92	145	214	337
Other wireline	129	177	204	239	289
sDSL	9	13	16	30	34
Mobile wireless	224	4,188	16,242	43,025	93,247

Source: FCC, *Internet Access Services: Status as of June 30, 2013*, June 2014, at Table 7, available at https://apps.fcc.gov/edocs_public/attachmatch/DOC-327829A1.pdf.

- (53) Although I lack the data to perform local market share calculations, I would suggest that the Commission staff do so for each local cable franchise area in which Comcast or TWC operate. I am aware of no reason to expect that the local shares would be very much less suggestive of market power. Indeed, the 65% national measure for market share appears to underestimate cable's position in the market because these data represent national statistics, and include areas where cable is not present. If one focused on the relevant antitrust geographic market, which is local, cable's share should be higher.
- (54) As described above, mobile wireless, to the extent it is an economic substitute at all, is very likely outside a relevant market for fixed broadband access, and because mobile is so popular for *non-substituting* uses, it would in any case be misleading to include it in evaluating market shares.⁶⁵
- (55) In market-share terms, therefore, it appears that, for most households, there are two primary options for the domestic broadband connection that they would use for data- and bandwidth-intensive uses: the incumbent cable ISP and the incumbent telephone company. For some households some other options are available, but those are not widely used. And of course, two or even three competitors usually are not automatically considered sufficient for a fully competitive market but rather are referred to as a duopoly or an oligopoly. In some markets, the presence of two or three competing providers can yield competitive outcomes and ensure that conduct harmful to customers is deterred

⁶⁵ DOJ and FTC, "Horizontal Merger Guidelines," Aug. 19, 2010, at 8, available at <http://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf> ("Defining a market broadly to include relatively distant product or geographic substitutes can lead to misleading market shares. This is because the competitive significance of distant substitutes is unlikely to be commensurate with their shares in a broad market. Although excluding more distant substitutes from the market inevitably understates their competitive significance to some degree, doing so often provides a more accurate indicator of the competitive effects of the merger than would the alternative of including them and overstating their competitive significance as proportional to their shares in an expanded market."). For example, the *Guidelines* suggest that in evaluating a merger between two motorcycle companies, it would be misleading to define the relevant market to include cars. *Id.* at Ex. 4.

and/or readily substituted around, but this cannot simply be assumed. On the contrary, while presumptions of market power based solely on concentration are less strong in modern competition analysis than they used to be, the 2010 *Horizontal Merger Guidelines* correctly recognize that highly concentrated oligopolies are likely, though not inherently certain, to be inadequately competitive.⁶⁶

III.D.2. Margins and market power for cable broadband

- (56) In addition, I suggest that the Commission calculate gross margins to estimate the Lerner Index for cable ISPs and recognize that it illuminates the residual elasticity of demand.⁶⁷ One complexity here is that many cable consumers buy broadband Internet access as part of a bundle, which often includes video programming and/or telephone service. Although this modifies the calculations,⁶⁸ the fact remains that high gross margins signal low demand elasticity, unless firms are leaving a lot of money on the table (money that they could attract with a price cut that would also presumably improve how they are viewed by their customers and potential customers).

III.D.3. Cable has significant advantages over both satellite and DSL and seldom faces competition from FTTP

- (57) Within fixed broadband Internet access service, it appears that cable broadband service has significant advantages over both satellite and many forms of DSL and that it faces competition from FTTP in only a relatively small number of local markets.
- (58) As discussed above, satellite broadband has several significant limitations (both technical and economic) compared to cable, which limit it as a realistic alternative to cable broadband. First, as indicated in Figure 1, it is generally more expensive than, for example, Comcast's broadband service. Second, the data cap is much lower for satellite – no more than 25 GB per month for peak periods,⁶⁹ which is less than half the mean broadband aggregate usage (downstream and upstream) (51.4 GB) that Sandvine reports for fixed access broadband. Third, satellite can be severely degraded by weather conditions, including snow and wind. Finally, satellite suffers from significantly higher latency, which degrades the quality of certain popular applications, like online gaming, VOIP and video conferencing. These limitations are presumably at least part of the reason for satellite's extremely small share within the fixed broadband market (only about 1 percent nationwide according to the

⁶⁶ DOJ and FTC, "Horizontal Merger Guidelines," Aug. 19, 2010, at § 2.1.3, *available at* <http://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf>.

⁶⁷ *See, e.g.,* Dennis W. Carlton & Jeffrey M. Perloff, *Modern Industrial Organization*, 4th ed. (Boston, MA: Pearson/Addison Wesley, 2005) at 92–93.

⁶⁸ For example, in evaluating the demand consequences of a strategy that directly affects end-users by \$1 per month, one can take the \$1 as a percentage of the overall bundle price and compare it with the dollar gross margin on the bundle. This would be appropriate to the extent that users are on the margin between buying the bundle and buying nothing from the firm in question; to the extent that buyers are on other margins, the calculation would be appropriately modified.

⁶⁹ *See* sources within Figure 1.

FCC's 477 data).⁷⁰ This small market share tends to confirm satellite's weakness as an attractive alternative for most consumers and suggests low diversion ratios (to satellite from cable in response to a price increase in cable broadband).

- (59) DSL offered by incumbent telephone companies is cable's biggest rival, for instance as gauged by share of subscribers to fixed broadband access.⁷¹ But as discussed above, certain types of DSL are significantly slower than cable broadband, and some are too slow to support video streaming. In addition, with many types of DSL, it is impossible to provide an integrated bundle of broadband and MVPD services that is provided over the same dedicated connection as the broadband service, as cable companies can and do.⁷² Although DSL carriers can partner with an MVPD provider, such as a DBS provider, to provide a synthetic bundle, AT&T and DirecTV have asserted that these arrangements suffer from serious limitations compared with integrated bundles,⁷³ and DSL providers presumably will not be partnering with the dominant MVPD provider.
- (60) FTTP broadband appears to be technically equal or superior to cable broadband in some respects, but it has been deployed in only a relatively small number of areas (either by an incumbent telephone company that is replacing its copper network, or by an overbuilder like Google Fiber) and thus is available to only a limited subset of customers.

III.E. Dr. Israel's claim that Comcast and TWC face ample competition is too optimistic

- (61) Drs. Israel, Rosston and Topper claim that large cable companies such as Comcast and TWC have no significant market power in the provision of video programming and Internet access to consumers.⁷⁴ Dr. Israel points out that the December 31, 2012, FCC *Internet Access Services* report indicates that "approximately 97 percent of households are located in census tracts in which two or more fixed

⁷⁰ See FCC, *Internet Access Services: Status as of June 30, 2013*, June 2014, at Table 7, available at https://apps.fcc.gov/edocs_public/attachmatch/DOC-327829A1.pdf. Satellite is also (not surprisingly) traditionally most popular with consumers where cable is not offered, so that I would expect its market share in cable markets to be even lower than its national share.

⁷¹ DOJ, "Voice, Video and Broadband: The Changing Competitive Landscape and Its Impact on Consumers," Nov. 2008, at 19, available at <http://www.justice.gov/atr/public/reports/239284.pdf>.

⁷² In the second quarter of 2014, 36% of Comcast customers were triple product customers (purchasing cable, voice, and internet from Comcast), and 32% were double product customers (purchasing at least two products from Comcast). Comcast, "Comcast reports 2nd Quarter 2014 Results," accessed July 31, 2014, available at <http://www.cmcsk.com/releasedetail.cfm?ReleaseID=861091>.

⁷³ See, e.g., AT&T and DirecTV, *Applications of AT&T Inc. and DIRECTV for Consent to Assign or Transfer Control of Licenses and Authorizations*, MB Docket No. 14-90, Description of Transaction, Public Interest Showing and Related Demonstrations, at 26; Declaration of Lori Lee at 25-28; Declaration of Paul Guyardo at 10.

⁷⁴ Israel Decl., ¶ 28; An Economic Analysis of the Proposed Comcast – Time Warner Cable Transaction, Gregory L. Rosston and Michael D. Topper, *In re Applications of Comcast Corp. and Time Warner Cable Inc.*, No. 14-57 (F.C.C. Apr. 8, 2014) [hereinafter Rosston & Topper Decl.], ¶¶ 23, 170.

broadband providers report offering at least one customer at least 3 Mbps downstream and 768 kbps upstream.”⁷⁵

- (62) As Dr. Israel recognizes in a footnote, the FCC report on which he relies specifically warns of limitations in using its figures to gauge local competitive conditions:

[H]owever, we emphasize that a provider that reports residential fixed-location connections of a particular speed in a particular census tract may not necessarily offer service at that speed everywhere in the census tract. Accordingly, the number of providers shown in Figure 5(a) does not necessarily reflect the number of choices available to a particular household, and does not purport to measure competition. We note that the Commission has adopted changes to Form 477 that will enable a more precise analysis in future.⁷⁶

- (63) It appears that most households have at most two wired telecommunications networks: the incumbent local cable company and the incumbent local telephone company.⁷⁷ The broadband service provided by the incumbent local telephone company often uses DSL, which as I describe in section III.D.3 above is generally inferior to the service provided via cable modem.⁷⁸ In addition, the quality of DSL service depends significantly on the length and condition of the copper connection, causing the available DSL speed to vary considerably within an area.⁷⁹ Therefore, it is likely that the fastest DSL speed reported in a census tract will not be available throughout the census tract.
- (64) While some areas are served by overbuilders, the FCC’s 2010 *National Broadband Plan* found that only four percent of US households had a choice of three or more wireline broadband connections.⁸⁰

⁷⁵ Israel Decl., ¶ 43.

⁷⁶ FCC, *Internet Access Services: Status as of Dec. 31, 2012*, Dec. 2013, at 9, available at http://transition.fcc.gov/Daily_Releases/Daily_Business/2013/db1224/DOC-324884A1.pdf.

⁷⁷ According to the FCC’s *National Broadband Plan*, approximately 96% of the population in 2010 had “at most two wireline providers.” See *National Broadband Plan* at 37. See also DOJ, “Voice, Video and Broadband: The Changing Competitive Landscape and Its Impact on Consumers,” Nov. 2008, at pg. 19, available at <http://www.justice.gov/atr/public/reports/239284.pdf> (“The principal competitors in providing residential broadband services continue to be: (1) the incumbent telephone companies, using either DSL over copper or more advanced fiber networks (such as Verizon’s FiOS); and (2) the incumbent cable companies, providing cable modem service over hybrid fiber-coaxial cable.”)

⁷⁸ See Robert C. Atkinson et al., *Broadband in America - 2nd Edition: Where it is and Where it is Going (According to Broadband Service Providers)*, May 2011, available at http://www4.gsb.columbia.edu/filemgr?file_id=738763. (“AT&T’s U-Verse and Verizon’s FiOS currently [Q4 2010] cover approximately 35% of US households and plan to reach 40% at the end of their deployment scheduled.”) Further, DSL has a limited upgrade potential compared to other technologies. Whereas cable and fiber “intrinsically support higher bandwidths, and can support even higher speeds with more incremental investments,” the FCC notes, “those ISPs using DSL technology show little or no improvement in maximum speeds” See FCC, *2014 Measuring Broadband America: A Report on Consumer Fixed Broadband Performance in the U.S.*, 2014, at 14, available at <https://www.fcc.gov/reports/measuring-broadband-america-2014>.

⁷⁹ FCC, *2014 Measuring Broadband America: A Report on Consumer Fixed Broadband Performance in the U.S.*, 2014, at 14, available at <https://www.fcc.gov/reports/measuring-broadband-america-2014>.

⁸⁰ See *National Broadband Plan* at 37.

In a submission to the Department of Justice, RCN stated that it was “the only cable-over builder that competes in

This suggests that, to the extent the FCC Plan does imply that many consumers have a third fixed broadband option, one of the three may often be satellite, which is a weak competitor in part for the reasons discussed above, and as reflected in its very small share of the fixed broadband market. And one of the three will often be DSL, which as noted above, is sometimes inferior and whose strength as a substitute for cable is relatively likely to vary even over a census tract.

- (65) When Dr. Israel builds on his opinion that Comcast and TWC lack substantial market power, he seems to use it to infer that they could have no incentive to engage in conduct (including on the content side of the market) that would harm their subscribers' user experience and leave subscribers dissatisfied.⁸¹ For example, if the merged firm were to block or slow certain outside content, he appears to suggest that enough subscribers would switch to rival ISPs so that Comcast and TWC would regret trying such a stratagem, notwithstanding the possibility (although he also downplays the possibility) that such a stratagem could have competitive benefits for them.
- (66) But subscribers already appear to be less than satisfied with service provided by Comcast and TWC, yet very few subscribers have substituted to satellite, terrestrial fixed wireless, or overbuilders. Thus it would be a major change in response patterns if a small but significant increment in dissatisfaction would radically change that. Substantial numbers of broadband consumers do choose telephone company ISP service (typically DSL) instead, but this suggests duopoly, not vigorous multi-firm competition.
- (67) One specific calibration or test of how many subscribers would leave in response to incremental dissatisfaction is to ask how many would leave in response to a price increase. That measure, broadly demand elasticity, can be expected to be commensurate with the inverse of economic gross margins. I do not have good data on economic gross margins for Comcast and TWC, but the FCC could ask for it, and based on public sources, consistent with the non-margin evidence of limited substitution as described above, I believe the answer would be that a dramatic loss of subscribers would be

several major U.S. geographic markets directly with cable companies and Verizon FiOS/DSL in three product markets (*i.e.*, wireline voice, wireline broadband Internet access, and wireline video programming.)” In particular, RCN stated that it competed with these incumbents in Boston, Philadelphia, Washington DC, New York City, Chicago, and the Pennsylvania Lehigh Valley. However, RCN stated that the incumbents “dominate the three retail product lines in which RCN competes.” *See* Comments Regarding the Proposed Final Judgment Submitted on Behalf of RCN Telecom Services, LLC., *United States v. Verizon Communications Inc.*, No. 1:12-cv-01354 (RMC) (D.D.C. Mar. 11, 2013), available at <http://www.justice.gov/atr/cases/f294400/294497-3.pdf>.

Overbuilders are limited as to how many subscribers they can reach. While they may do well in small clustered areas, in their best markets having 20%–30% penetration, in the whole US market their contributions are small. *See* Broadcasting and Cable, “Bernstein Research Likes What it sees in Google KC Fiber,” accessed July 30, 2014, <http://www.broadcastingcable.com/news/news-articles/bernstein-research-likes-what-it-sees-google-kc-fiber/114435?nopaging=1>. In 2009, RCN accounted for only 0.59% of all fixed line video subscribers. In 2012 and 2011, Frontier accounted for 1.8% of fixed line high speed data subscribers. Another overbuilder, Surewest, accounted for 0.1% of the fixed line high speed data subscribers. *See* Market share data for Surewest and RCN, via Bloomberg LP, accessed Aug. 8, 2014.

⁸¹ Israel Decl., ¶ 37.

unlikely.⁸² Indeed, Comcast's Executive Vice President declined to assure a Congressional hearing that prices would not continue to rise,⁸³ which would appear irrational if a price rise would lead to a dramatic loss of subscribers, unless not only would costs continue to rise but economic gross margins are already very thin.

- (68) Another test for which the FCC could seek data is to see how many Comcast broadband subscribers left during Comcast's disputes with Netflix, which clearly worsened the Comcast subscriber experience. A refinement of this test would examine the difference-in-differences to see whether Comcast subscriber attrition among Netflix users greatly exceeded that among non-Netflix users. (A related test would ask how many new subscribers were attracted, relative to trend, when those disputes were resolved.)

⁸² According to a J.P. Morgan estimate, Comcast had a EBITA margin of 41.1% for its cable segment in 2013. Philip Cusick, et al., "Comcast: Cable, NBCU Firing on All Cylinders; Video Loss to slow Further as Video Experience Keeps Improving," J.P. Morgan, Jan. 29, 2014.

⁸³ United States House of Representatives Judiciary Committee, "Hearing: Oversight Hearing on 'Competition in the Video and Broadband Markets: The Proposed Merger of Comcast and Time Warner Cable,'" recording available at <http://judiciary.house.gov/index.cfm/hearings?ID=301C520F-5B9E-4E43-B2B5-B131B3B88951>. For the Cohen statement, *see* 2:12:30–2:13:07 of the recording.

IV. Although the parties do not offer consumer service in the same geographic area, the merger raises concerns directly on the household side of the market

- (69) The Applicants and Drs. Rosston, Topper, and Israel argue that the proposed merger will not raise horizontal concerns on the household side of the market, because the parties do not compete in the same geographic areas.⁸⁴ For example, Dr. Israel argues that, for that reason, the merger “will not reduce the number of choices available to residential broadband customers . . . [and] [c]onsequently, the transaction creates no horizontal incentives for the combined firm to raise prices or reduce quality to residential consumers . . .”⁸⁵
- (70) Various Bell Operating Companies (“BOCs”) made this same argument when they sought to merge over a decade ago. As the Commission repeatedly recognized in reviewing those mergers, however, this argument is too narrow. In the case of the BOC mergers, the Commission noted that the mergers would reduce the Commission’s ability to detect and respond to anticompetitive discrimination and raising rivals’ costs strategies, while at the same time increasing the merged firm’s incentive to engage in such conduct.⁸⁶
- (71) In this section, I first discuss why Comcast, even before the proposed merger with TWC, has the incentive and ability to engage in exclusionary strategies such as anticompetitive discrimination. Second, I explain why the merger is likely to increase the incentive to engage in such strategies. Third, I discuss how the proposed merger, by reducing the ability to compare other major incumbent cable companies and ISPs against the merged firm’s conduct, reduces the ability to detect and respond to potential exclusionary strategies, departures from the desirable features of net neutrality, or simply poor performance. Finally, I observe that the merger will permanently eliminate potential competition between Comcast and TWC.

⁸⁴ See Applications and Public Interest Statement: Description of Transactions, Public Interest Showing, and Related Demonstrations, *In re Applications of Comcast Corp. and Time Warner Cable Inc.*, No. 14-57 (F.C.C. Apr. 8, 2014) [hereinafter Application], at 127; Rosston & Topper Decl., ¶ 170; Israel Decl., ¶ 18.

⁸⁵ Israel Decl., ¶ 19. See also Rosston & Topper Decl., ¶ 170 (“The franchise areas of Comcast’s and TWC’s cable systems do not overlap other than in minimal ways. As a result, the two companies’ cable systems are not substitutes and do not compete with each other for MVPD customers. Thus, the transaction will not change the number of MVPDs competing to serve any individual customer.”)

⁸⁶ See, e.g., Memorandum Opinion and Order, *In re Applications of NYNEX Corp., Transferor, and Bell Atlantic Corp., Transferee, For Consent to Transfer Control of NYNEX Corp. and Its Subsidiaries*, 12 FCC Rcd 19985 (1997 FCC LEXIS 4349) [hereinafter *Bell Atlantic/NYNEX Order*], ¶ 16; Memorandum Opinion and Order, *In re Applications of Ameritech Corp., Transferor, and SBC Communications Inc., Transferee, For Consent to Transfer Control of Corporations Holding Commission Licenses and Lines*, 14 FCC Rcd 14712 (1999 FCC LEXIS 5069) [hereinafter *SBC/Ameritech Order*], ¶ 61.

IV.A. Comcast, prior to the merger, has an incentive to engage in exclusionary strategies against competitors

- (72) The Commission has long recognized that incumbent firms with market power likely have the incentive, and frequently the ability, to discriminate against, raise the costs of, or attempt to foreclose rivals.⁸⁷ With respect to possible discrimination against competing MVPDs, the Commission’s *Comcast/NBC-U* Order found that Comcast had the incentive and ability to disadvantage its MVPD rivals by foreclosing them, temporarily or permanently, from access to Comcast’s “marquee” programming, thus making them “less effective competitors.”^{88, 89}
- (73) The Commission has previously recognized that ISPs, like Comcast, may have the incentive and ability to discriminate against online content and applications providers, particularly, if the ISP views the content provider as competing with the ISP’s own content.⁹⁰ In the *Open Internet* Order, the Commission found that “broadband providers may have economic incentives to block or otherwise disadvantage specific edge providers or classes of edge providers, for example by controlling the transmission of network traffic over a broadband connection, including the price and quality of access to end users. A “broadband provider might use this power to benefit its own or affiliated offerings at the expense of unaffiliated offerings.”⁹¹
- (74) Although the United States Court of Appeals for the District of Columbia subsequently vacated certain portions of the Commission’s *Open Internet* Order rules, it expressed support for the Commission’s findings that ISPs might have the incentive and ability to discriminate against edge providers or to charge fees to edge providers in return for providing prioritized access or excluding rival edge providers.⁹² In relevant part, the court found:

⁸⁷ For example, in the *SBC-Ameritech* Order, the FCC states that “the incumbent LECs would be able to discriminate against and exclude local rivals.” See *SBC/Ameritech* Order, ¶ 16.

⁸⁸ Memorandum Opinion and Order, *In re Applications of Comcast Corp., General Electric Co. and NBC Universal, Inc., for Consent to Assign Licenses and Transfer Control of Licenses*, 26 FCC Rcd 4238 (2011 FCC LEXIS 414) [hereinafter *Comcast/NBC-U* Order], ¶¶ 36–37.

⁸⁹ In addition, it has been alleged that Comcast has sought to block or delay entry by competing MVPDs into its local franchise areas by, *inter alia*, refusing to license “must have” video programming, interfering with the entrant’s access to contractors necessary to build its network, offering targeted anticompetitive pricing, and using its political influence to block the grant of a local cable franchise. Of course, I take no position here on the merits of those allegations. Fourth Amended Complaint, *Glaberson v. Comcast Corp.*, No. 03-cv-6604 (E.D. Pa. Apr. 2, 2014) at ¶ 77; Bob Fernandez, “Legal Battle with RCN is not Over for Comcast,” *Philly.com*, Apr. 8, 2013, http://articles.philly.com/2013-04-08/business/38348677_1_comcast-corp-greater-philadelphia-cablevision-inc-comcast-decision.

⁹⁰ The range of services the cable companies are offering in competition with the content and services over the Internet is expanding beyond the provision of video over the Internet. Comcast recently began to offer home security and related services branded as Xfinity Home.

⁹¹ *Open Internet* Order, ¶ 21 (footnote omitted). The Commission went on to note that “[o]nline video is rapidly growing in popularity” and that “[s]everal MVPDs have stated publicly that they view these services as a potential competitive threat to their core video subscription service.” See *Id.* at ¶ 22 (footnotes omitted).

⁹² *Verizon v. FCC*, 740 F.3d 623 (2014 U.S. App. LEXIS 680) (D.C. Cir. 2014).

[T]he Commission has adequately supported and explained its conclusion that, absent rules such as those set forth in the *Open Internet Order*, broadband providers represent a threat to Internet openness and could act in ways that would ultimately inhibit the speed and extent of future broadband deployment. First, nothing in the record gives us any reason to doubt the Commission’s determination that broadband providers may be motivated to discriminate against and among edge providers. . . . Broadband providers also have powerful incentives to accept fees from edge providers, either in return for excluding their competitors or for granting them prioritized access to end users.

Moreover, as the Commission found, broadband providers have the technical and economic ability to impose such restrictions.⁹³

- (75) In the *Comcast/NBC-U Order*, the Commission found that Comcast *specifically* had the incentive and ability to foreclose, disadvantage, or raise the cost of its rivals. Specifically, it found that even prior to the *Comcast/NBC-U* merger, Comcast had the incentive and ability to: (1) block Comcast’s MVPD rivals, either temporarily or permanently, from access to video programming that it controls or raise programming costs to its rivals;⁹⁴ (2) use its control “over video programming, broadband, or set-top boxes to harm current and emerging online rivals;” and (3) “deny unaffiliated video programmers access to Comcast subscribers or impose unreasonable terms for distribution on Comcast’s systems.”⁹⁵ To address these potential competitive harms, the merging parties offered a number of detailed commitments, including a temporary commitment to comply with the *Open Internet Order* rules even if they were overturned in court, and the Commission adopted these commitments as a condition of approving the merger.⁹⁶
- (76) Although the conditions imposed by the Commission were intended to mitigate the anticompetitive effects of the merger by constraining Comcast’s actual *conduct*, they are temporary and would not alter Comcast’s *incentives* to engage in anticompetitive discrimination.⁹⁷ Moreover, given the multitude of ways that Comcast could discriminate against rivals, it seems unrealistic to expect that the conditions imposed by the Commission would be effective in preventing all forms of discrimination, or even that the Commission could foresee all such possibilities. Perhaps illustrating this general point, and as I discuss in more detail in section V.C, Netflix recently complained that Comcast was deliberately slowing the delivery of Netflix content to Comcast subscribers by failing to augment interconnection ports,⁹⁸ in essence complaining that Comcast was exploiting a loophole in

⁹³ *Id.* at *645–46.

⁹⁴ *Comcast/NBC-U Order*, ¶ 29.

⁹⁵ *Comcast/NBC-U Order*, ¶ 28.

⁹⁶ *Comcast/NBC-U Order*, ¶¶ 4–6.

⁹⁷ The majority of the conditions have a term of seven years after which they expire. *See Comcast/NBC-U Order*, ¶ 120.

⁹⁸ *See, e.g., Comments of Netflix, Inc., In re Protecting and Promoting the Open Internet*, GN Docket No. 14-28 (July 15,

that the Commission did not impose rules on Comcast's conduct at the points at which it interconnects with other networks. Regardless of the specific actions Comcast did or did not take, the potential for such conduct was not explicitly addressed in the Commission's conditions. Similarly, other potential types of anticompetitive conduct are simply not covered by the merger conditions. For example, it has been alleged that Comcast sought to block the entry of RCN, a cable overbuilder, into the Philadelphia DMA by a variety of means including lobbying Philadelphia government officials against RCN and restricting RCN's access to contractors that could build RCN's network.⁹⁹ While I am not offering an opinion as to whether such allegations were true, the fundamental point is that anticompetitive conduct can take many forms, some of which are not easily diagnosed, and while conditions can prevent some anticompetitive conduct, it is difficult to craft conditions that protect against all of them.

- (77) Thus, in reviewing whether the proposed Comcast/TWC merger is in the public interest, the Commission should ask (1) whether the currently proposed merger will increase the merged entity's incentive or ability to engage in such anticompetitive conduct; and (2) whether the merger will somehow reduce the Commission's ability to detect and punish such anticompetitive behavior. As I explain below, the answer to both questions is "yes."

IV.B. The merger will increase Comcast's incentives to engage in exclusionary and anticompetitive discriminatory strategies

- (78) The merger of Comcast and TWC will increase the merged parties' incentives to engage in exclusion and harmful discrimination by expanding the merged parties' footprint.

2014) [hereinafter Netflix Open Internet Comments], at 12–15; Letter from Markham C. Erickson, Counsel to Netflix, Inc. to Marlene Dortch, Secretary, Federal Communications Commission (August 1, 2014), Attachment at 2 ("In the case of Comcast, Netflix purchased all available transit to reach Comcast's network. Every single one of those transit links to Comcast was congested (even though the transit providers requested extra capacity). The only other available routes into Comcast's network were those where Comcast required an access fee."); *see also* Justin Bachman, "Comcast Turns Back Cord-Cutting Tide, Adds New Video Customers," *Bloomberg Businessweek*, Apr. 22, 2014, available at <http://www.businessweek.com/articles/2014-04-22/comcast-turns-back-cord-cutting-tide-adds-new-video-customers>. ("Netflix battled Comcast this winter over the degraded performance of its streaming service on the cable firm's pipes; service improved after Netflix agreed to pay Comcast for carrying its video traffic. Netflix is responsible for more than a quarter of all online data traffic, rising to more than a third in peak viewing periods."); Jon Brodtkin, "Netflix Performance on Verizon and Comcast has been Dropping for Months," *Ars Technica*, Feb. 10, 2014, <http://arstechnica.com/information-technology/2014/02/netflix-performance-on-verizon-and-comcast-has-been-dropping-for-months/>. ("Netflix's speed rankings show that video streaming performance on Verizon and Comcast has been dropping for the past three to four months. . . . Netflix didn't offer any analysis of why performance would have dropped in the past few months. We do know that in the past, Verizon and Comcast have each been involved in disputes with Internet bandwidth providers, and that these disputes can prevent peering infrastructure from being upgraded. This affects all traffic, but it places a more noticeable toll on streaming video because of how much bandwidth it requires.")

⁹⁹ *See, e.g.*, Bob Fernandez, "Legal Battle with RCN Is Not Over For Comcast," *Philly.Com*, Apr. 8, 2013, http://articles.philly.com/2013-04-08/business/38348677_1_comcast-corp-greater-philadelphia-cablevision-inc-comcast-decision.

- (79) Many exclusionary or anticompetitive strategies impose some costs on the firm engaging in them. One cost is the potential for regulatory or antitrust response. For example, should the Commission find that Comcast intentionally slowed the speed with which competing online content was delivered to Comcast’s subscribers and that such conduct violated either the existing *Open Internet* Order transparency rule or any new *Open Internet* Order rules that the Commission might adopt, then Comcast might be subject to significant penalties. In addition, to the extent that such discrimination degrades the quality of service offered to its subscribers, this could result in consumer defections to the extent it occurs in locales where there is a viable substitute, which would result in loss of revenue to Comcast. Such costs are not always adequate to deter the conduct, but a rational firm will take them into account and balance the potential benefits of such anticompetitive conduct against the potential costs.
- (80) Exclusionary conduct by Comcast may often (though it will not always) spill over and benefit other incumbent cable companies and/or incumbent ISPs outside Comcast’s footprint. Post merger, Comcast will have a bigger footprint and will thus internalize a greater proportion of the anticompetitive benefits, which will increase its incentive to engage in such strategies.
- (81) The Commission previously recognized this possibility in the *SBC/Ameritech* and *Bell Atlantic/GTE* orders. In evaluating the potential competitive effects of mergers between major incumbent local exchange carriers (“LECs”), which operated in different geographic markets and (in certain important respects) did not directly compete against each other, the Commission found that the merged entities would have increased incentives to engage in various anticompetitive activities:

In spite of the existing incentive to discriminate against rivals providing retail services, both theoretical and empirical evidence suggests that incumbent LECs may not be discriminating to the full extent of their ability. For example, the benefits of increased levels of discrimination may not justify the increased financial costs and corresponding risks of detection and punishment. . . .

In many cases, discriminatory conduct by an incumbent LEC in its region affects a competitor in areas both inside and outside the incumbent’s region. Effects outside the region (externalities or “spillover” effects) can directly or indirectly harm customers, whose business the incumbent LEC is seeking to gain. . . .

Because after the merger the larger combined entity would realize more of the gains from such external effects, the marginal benefit and corresponding incentive to discriminate in each area would increase. As a result, the level of discrimination engaged in by the combined entity in each region within the combined territory

would be greater than the sum of the level of discrimination engaged in by the two individual companies in their own, separate regions, absent the merger.¹⁰⁰

- (82) More specifically, the Commission found that after consummation of the merger, SBC would have an increased incentive and ability to discriminate against competing providers of advanced services,¹⁰¹ long-distance services,¹⁰² and LECs.¹⁰³ Interestingly, the Commission specifically cited a concern that an incumbent LEC might seek to disadvantage competing LECs by failing to provision a sufficient number of interconnection trunks. The Commission explained:

The incumbent LEC, for example, may fail to provision enough equipment for a competing LEC so that a higher percentage of the competitor's calls are blocked from terminating in the incumbent's region. When a competitor orders trunks in the incumbent's end office, the incumbent may fail to make available the number of trunks requested by [the] competitor, or it may delay installing the trunks in the end office. This type of discrimination is more subtle and less detectable than blatant selective call degradation.¹⁰⁴

- (83) The Commission's analysis concerned the incumbent's unilateral incentives for unilateral acts of exclusion. One such act could be targeted at an important independent content supplier or complementor, whose offerings improve the user experience both for Comcast subscribers and for subscribers to other ISPs. If Comcast has the scale to self-supply but other ISPs do not, then it may have an anticompetitive motive to undermine the complementor, because the impact on rival ISPs will be more damaging (e.g., if its self-supply were on average inferior) than any impact on Comcast's own offering. Scale can make self-supply and, thus, such a strategy more feasible, adding to the Commission's point about internalizing spillovers in a bigger footprint.
- (84) By no means am I suggesting that every act of vertical integration and self-supply is anticompetitive: on the contrary, many are not. And it is precisely because it is often very difficult to diagnose such cases, and because they are mixed in with pro-competitive ones, that it is important not to allow mergers to strengthen incentives for exclusionary conduct and thus to worsen the mix, especially in cases where the mix is already problematic, as the Commission has found.

¹⁰⁰ *SBC/Ameritech* Order, ¶¶ 191–93 (footnotes omitted).

¹⁰¹ *SBC/Ameritech* Order, ¶¶ 207–11.

¹⁰² *SBC/Ameritech* Order, ¶¶ 216–30.

¹⁰³ *SBC/Ameritech* Order, ¶¶ 243–45.

¹⁰⁴ *SBC/Ameritech* Order, ¶ 241. See also *In re Implementation of the Cable Television Consumer Protection and Competition Act of 1992*, 22 FCC Rcd 17791 (2007 FCC LEXIS 7082), ¶¶ 54–55. (finding that both increased horizontal concentration and clustering increased vertically integrated cable companies incentive and ability to foreclose affiliated programming from competing MVPDs); *In re Review of the Commission's Program Access Rules and Examination of Programming Tying Arrangements*, 25 FCC Rcd 746 (2010 FCC LEXIS 381), at *61 (noting that the Commission has found that "the grouping of commonly owned cable systems into regional clusters enhances the ability and incentive of vertically integrated cable firms to engage in unfair acts with their affiliated programming.")

- (85) A separate point concerns bilateral joint incentives for exclusionary contracts or relationships with complementors, such as certain exclusive contracts. When exclusion is mediated through agreements with complementors such as programmers, bilateral as well as unilateral incentives come into play. Comcast would gain from the weakening of a rival in its footprint if Comcast can convince a key programming supplier (or other complementor) to raise, even modestly, its nationwide prices above what the supplier would otherwise set to a rival MVPD, online video distributor (“OVD”), or ISP. Within Comcast’s geographic footprint, such an arrangement must be jointly profitable for modest price increases, as Comcast’s first-order gain from weakening the rival will outweigh the second-order loss to the supplier from setting a price higher than what is individually optimal. Such a price increase, however, would at least slightly harm the program supplier outside Comcast’s footprint, and Comcast would have little at stake there. Thus, a bigger footprint would not only enable Comcast to internalize a bigger fraction of the anticompetitive gains, but it would also shrink the region over which the joint gains would be negative.
- (86) Again, I am not saying that every vertical restraint is anticompetitive. But some are, and the diagnosis is not always easy (for instance, with counterbidding, multilateral as well as bilateral incentives play a role). As a consequence, it is desirable to avoid allowing mergers to strengthen the incentives for such restraints, and (as I discuss in the next subsection) to retain as many tools of diagnosis as possible.

IV.C. The merger of Comcast and TWC will weaken the ability of the Commission, consumers, and competitors to use benchmarks to detect and address practices that harm competition and consumers

IV.C.1. Comparative practices analyses, or benchmarking, is a valuable tool for oversight and for identifying anticompetitive conduct

- (87) The Commission and other regulators have long used “comparative analyses of the practices of similarly-situated” firms as a way to regulate in an “effective, yet minimally intrusive manner.”¹⁰⁵ Such comparative practices analyses, sometimes called “benchmark regulation” or “yardstick regulation,” provide valuable information to regulators, consumers, and competitors about regulated firms’ network features, capabilities and costs, and about the practices of regulated firms.
- (88) In general, there are three types of comparative practices analyses. First, regulators can use *averages*. For example, the Commission used average practices benchmarking in setting the X-factor for incumbent LEC price caps.¹⁰⁶ Second, regulators can use *best practices*. For example, under the

¹⁰⁵ *SBC/Ameritech* Order, ¶ 101.

¹⁰⁶ See generally *SBC/Ameritech* Order, ¶ 112; Memorandum Opinion and Order, *In re Application of GTE Corp., Transferor, and Bell Atlantic Corp., Transferee, For Consent to Transfer Control of Domestic) and International Sections 214 and 310 Authorizations*, 15 FCC Rcd 14032 (2000 FCC LEXIS 5946) [hereinafter *Bell Atlantic/GTE*].

Telecommunications Act of 1996, incumbent LECs were required to provide interconnection at any “technically feasible point” in their networks.¹⁰⁷ In implementing this section, the Commission relied on best practices benchmarking, holding that “preexisting interconnection or access at [a particular point in the network] evidences the technical feasibility of interconnection or access at substantially similar points.”¹⁰⁸ Finally, regulators can use comparative practices analyses to identify *worst practices*. During the 1990s, the Commission made extensive use of comparative data that it collected from incumbent LECs to assess the performance of individual companies in setting rates, delivering service of satisfactory quality, and enforcing existing regulatory standards.

- (89) Comparative practices analyses could prove critical in enforcing any *Open Internet* Order rules that the Commission might adopt. If an Internet content provider were to complain that a particular ISP was degrading delivery of its content, then it would be informative and probative to compare the delivery of the content by similarly situated ISPs. Similarly, to the extent that the Commission decides to permit certain “commercially reasonable” prioritization arrangements, the availability of benchmarks is likely to be extremely useful in evaluating what is commercially reasonable. The availability of benchmark data will also assist the Commission in evaluating claims that a vertically integrated MVPD is foreclosing access to its programming to competing MVPDs, or that it is discriminating against unaffiliated video programmers.

IV.C.2. A merger of two major incumbents will reduce the number of benchmarks and limit the ability of the Commission to use comparisons

- (90) During the late 1990s, several BOCs sought to merge. In attempting to justify these mergers, the applicants argued, as the Applicants do here, that the merger would cause no adverse competitive effects because the firms operated in different geographic areas and did not compete directly against each other. The Commission flatly rejected this argument, finding, among other things, that the merger would weaken the effectiveness of comparative practices analyses. For example, in the *SBC/Ameritech* Order, the Commission found that “mergers between benchmark firms significantly weaken the effectiveness” of benchmark regulation.¹⁰⁹ The Commission further found that “the loss of an independent incumbent LEC will have a greater impact on reducing benchmarking’s effectiveness the larger the region of the combined entity and the smaller the number of similarly-situated firms remaining following the merger.”¹¹⁰ In addition, the Commission stated:

Order], ¶¶ 134, 139.

¹⁰⁷ Interconnection, 47 U.S.C. § 251(c)(2)(B) (1999).

¹⁰⁸ First Report and Order, *In re Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, 11 FCC Rcd 15499 (1996 FCC LEXIS 4312), at *15602, ¶ 198. See generally *SBC/Ameritech* Order, ¶ 132.

¹⁰⁹ *SBC/Ameritech* Order, ¶ 114. See also *Bell Atlantic/GTE* Order, ¶ 134.

¹¹⁰ *SBC/Ameritech* Order, ¶ 114. See also *Bell Atlantic/GTE* Order, ¶ 134.

When only a few similarly-situated benchmark firms remain, the harms to benchmarking increase more than proportionately with each successive loss of a firm as an independent source of observation. As the number of independent sources of observation declines, there is less likelihood that a significant “maverick” will emerge to undertake a strategic or management decision that departs from the other incumbents, and that may establish a best practice in the industry. Moreover, the best observed practice is likely to become worse simply because there are fewer observations. Finally, as the number of independent sources of observation decreases, deviations from average practices can be identified less confidently as unreasonable and punishable.¹¹¹

- (91) Finally, the Commission found that a “reduction in the number of independently-owned major incumbent LECs as a result of a merger increases the likelihood of coordination, either tacit or explicit, among the remaining firms in the industry for the purposes of reducing the effectiveness of comparative practices analyses.”¹¹²
- (92) Comcast and TWC can provide particularly useful and informative benchmarks for each other. As shown in Figure 5, they are the two largest cable MVPDs and two of the three largest wireline ISPs. Moreover, they use the same network technology, potentially sharpening comparisons of the two companies’ technical performance. The proposed merger thus would reduce the number of major cable companies (defined as those having at least two million MVPD subscribers) from five to four. While the number of major wireline broadband providers (again defined as those having at least two million) will only be reduced from eight to seven, only four of those use cable network architecture. Post-merger, Comcast would be more than 70% bigger than the second-largest ISP, AT&T, and more than three times bigger than the second largest cable company, Charter.

¹¹¹ *SBC/Ameritech* Order, ¶ 116 (footnote omitted). *See also Bell Atlantic/GTE* Order, ¶ 136.

¹¹² *SBC/Ameritech* Order, ¶ 121. *See also Bell Atlantic/GTE* Order, ¶ 140.

Figure 5. Pre- and post-merger shares of US wireline and cable broadband subscribers by the top eight providers

Provider	Wireline		Cable	
	Pre-merger%	Post-merger %	Pre-merger%	Post-merger%
Comcast	24.2%	34.7%	39.6%	56.9%
TWC	13.6%		22.2%	
AT&T	19.2%	19.2%	NA	NA
Verizon	10.5%	10.5%	NA	NA
Qwest	7.0%	7.0%	NA	NA
Cox	5.5%	5.5%	9.0%	9.0%
Charter	5.4%	8.4%	8.9%	13.8%
Cablevision	3.2%	3.2%	5.3%	5.3%
Other	11.4%	11.4%	14.9%	14.9%

Source: Q4 2013 cable and telecommunications carrier subscribers, via SNL Kagan, accessed Aug. 8, 2014.

Note: Comcast will divest 1.4M subscribers to Charter following the merger. Additionally, Comcast will divest 3.5M subscribers to an independent joint venture between Charter (with a 1/3 stake) and former shareholders of TWC (with a 2/3 stake). The post-merger subscriber shares take into account Comcast's divestiture. See Cecilia Kang, "Comcast Sells Subscribers to Charter to Help Clear Way for Merger with TWC," *Washington Post*, Apr. 28, 2014, http://www.washingtonpost.com/business/technology/comcast-sells-subscribers-to-charter-to-help-clear-way-for-merger-with-time-warner-cable/2014/04/28/e59ffb60-cf0a-11e3-937f-d3026234b51c_story.html.

- (93) Of course, cable companies and ISPs are subject to less stringent regulation and reporting requirements than were the incumbent LECs. Nevertheless, the Commission should be reluctant to give up its ability to use comparative practices analysis in identifying anticompetitive discrimination, attempted foreclosure, and raising rivals costs strategies.

IV.C.3. Benchmark data is also valuable for consumers and competitors

- (94) Comparisons with similarly situated cable companies and ISPs can also be valuable to consumers and competitors. Such comparisons may be informal and qualitative or data-intensive, drawing on data collected by the Commission or by public interest groups or private companies.
- (95) For competitors, such benchmark comparisons may assist them in identifying whether a particular MVPD or ISP is discriminating against them, such as by slowing the delivery of their content or trying to raise their costs. Such data would also assist them should they file a complaint with the Commission.
- (96) Similarly, consumers will benefit from such benchmark comparisons. For example, consumers examining Netflix's average speed data may learn that their ISP is delivering Netflix content significantly more slowly than similarly situated providers. One view would be that only comparisons between actual alternatives available to the consumer can help, but that view is unduly narrow. For example, a consumer might be alerted to search more actively for alternatives if he learns that his broadband provider is failing to measure up to benchmarks, even if the benchmarking comparisons

are not yet offering service in his area. And even if the consumer has no meaningful choice among service providers, then he can at least complain to the provider or to the Commission. Or he could be better informed as a local voter about how to respond if he concludes from local investigative reporting that local politicians are obstructing, or not cooperating with, a would-be overbuilder.

IV.D. Potential competition between Comcast and TWC will be permanently eliminated by the merger

- (97) One might reasonably expect incumbent cable companies to be especially likely and potent potential entrants into MVPD and ISP markets beyond their traditional franchise areas. They know the industry and the regulatory terrain, have established brands, have contracts with programming suppliers (and in some cases their own programming), are accustomed to dealing with interconnection issues, and in some cases (for instance, when a major new residential development is planned near a boundary between traditional cable territories) have the right facilities nearby.¹¹³
- (98) And, if scale economies are as significant as Dr. Israel claims, large cable companies such as Comcast and TWC would both be especially potent potential entrants and also be especially keen to expand their subscriber numbers by expanding into new geographies (as well as by attracting customers away from rivals within their footprints).
- (99) Thus far, we have seen little or no such attempts at expansion by major cable companies. But that is not because building into a new territory and competing against a cable incumbent is clearly impossible. It is evidently difficult, but overbuilders sometimes succeed, despite real disadvantages. RCN, for example, owns about 6,500 miles of fiber and operates in six urban markets.¹¹⁴ Similarly, Wide Open West operates in more than twenty cities across the Southern and Mid-Western United States.¹¹⁵ More recently, Google has begun building a fiber-to-the-home network in various neighborhoods in certain test cities and has the potential to achieve a significant market share in the footprint where it has built its network.¹¹⁶

¹¹³ For example, Comcast and TWC have adjacent territories in the New York City metropolitan area that includes suburbs in New York State, Connecticut and New Jersey.

¹¹⁴ “RCN Business’ Roeder on Ethernet, Dark Fiber and Wireless Backhaul Opportunities,” FierceTelecom, May 28, 2014, <http://www.fiercetelecom.com/special-reports/rcn-business-roeder-ethernet-dark-fiber-and-wireless-backhaul-opportunities>.

¹¹⁵ WOW!, “Locations,” accessed Aug. 6, 2014, <http://www.wowway.com/home-map>.

¹¹⁶ According to analyst reports, Google plans to roll-out its fiber network in 34 cities. See Marci Ryvicker, “Cable/Sat: Up Close and Personal with Google Fiber,” Wells Fargo Securities, July 9, 2014, at 4–5; James Ratcliffe and Denis Kelleher, “A Closer Look at Google Fiber Rollout Plans,” Buckingham Research Group, Feb. 20, 2014, at 2–3. Bernstein Research conducted a survey of the Kansas City market, where Google has deployed a fiber network, and found that 52% of residents would “definitely or probably” buy Google Fiber. See Broadcasting and Cable, “Bernstein Research Likes What it sees in Google KC Fiber,” accessed July 30, 2014, <http://www.broadcastingcable.com/news/news-articles/bernstein-research-likes-what-it-sees-google-kc>.

- (100) The unwillingness of large cable incumbents to expand by competitive entry into other cable incumbents' historical franchise territories is thus somewhat puzzling. Approval of the merger would make permanent the absence of such competitive expansion between Comcast and TWC. Without access to company documents we do not know whether the absence of that form of competition reflects fundamental facts unlikely to change, or whether it reflects a potentially unstable stand-off that it would be harmful to make permanent by merger.

IV.E. Scale efficiencies, competition, and the consumer experience

- (101) Dr. Israel claims that scale efficiencies are very important: that, in this context, big is good; and that to achieve scale, Comcast and TWC must merge (in other words, that scale is merger-specific):

The increased scale created by the merger will incentivize the combined firm to undertake investments and to pursue innovations that would not otherwise be profitable enough to pursue. Comcast's and TWC's ordinary-course-of-business plans and models reflect the fact that greater scale increases the profitability of investments involving fixed costs and thus that greater scale enables additional innovations to be brought to the marketplace profitably. . . . The transaction allows such scale-based benefits to be expanded and improved upon, by leveraging the combined footprints of Comcast and TWC to increase economies of scale and scope. . . .

With respect to wired networks, customers of the combined firm will benefit from increased investment in access networks, as well as metro, regional, and national core networks. Such investments are motivated by a combination of increased opportunities to serve business accounts, cross-regional economies of scope in regional core networks, and economies of scale in investing in the national core network. As one concrete example, incremental expansion of the combined firm's "plant" to serve more business customers—*e.g.*, expansion of the fiber backbone to reach more sites—will increase the overall capacity of the combined firm's network to the benefit of current and future business and residential customers. When Comcast or TWC build out to a new location, they generally do so with sufficient fiber capacity to serve future expansion opportunities because the cost of including extra fiber is low relative to the other costs associated with building out the network. All Comcast customers in the area can benefit from this additional capacity. . . .

With respect to *home networks*, customers of the combined network will likely benefit from increased investments in home network technologies made profitable by the combined firm's increased scale, including tools to enable consumers to manage all devices on the household's broadband network. TWC customers will also benefit from the faster rollout of Comcast's state-of-the-art routers and modems.¹¹⁷

Comcast's development of the X1 platform is an excellent example of the type of investment that can be undertaken only with sufficient scale. The X1 platform provides users with a high-quality user interface that facilitates, among other features, integrated search with instant play, access to Internet and television-enabled applications The X1 platform is characterized by high fixed costs and low variable costs.¹¹⁸

As a matter of economics, Comcast sees a sufficient return on this investment [the X1 platform] given its size. In contrast, this investment level would be less profitable at TWC given the smaller customer base from which associated revenues could be recovered.¹¹⁹

- (102) There are at least two problems with these claims. First, Dr. Israel's claim that economies of scale are so significant conflicts with his assertion that Comcast and TWC face strong competition in the provision of broadband to consumers. If Comcast and TWC did face such competition, then either or both could readily expand their scale and capture any scale efficiencies simply by improving their competitive offerings and thus taking customers from their supposedly many rivals. To put it another way, in the presence of strong product-market competition, pure scale efficiencies are not likely to be merger-specific.
- (103) Second, Dr. Israel's claim about consumer benefits appears at odds with available data. If scale leads to investments that significantly improve services offered to consumers, then one would expect larger cable companies to provide faster Internet access and one would expect consumers of larger cable companies to express higher levels of consumer satisfaction. On the contrary, as I describe below, Netflix data suggest (although of course they cannot prove a broad statement) that, although the larger cable companies have high advertised speeds and may have high speeds internally, in terms of actual realized speed of delivery of outside (specifically Netflix) content to their subscribers, they have recently tended to offer *slower* Internet content delivery.¹²⁰ And, as I describe next, an analysis of

¹¹⁷ Israel Decl., ¶ 14.

¹¹⁸ Israel Decl., ¶ 112.

¹¹⁹ Israel Decl., ¶ 113.

¹²⁰ Although Comcast and TWC are reported as generally meeting or exceeding their advertised speeds in the *2014 Measuring Broadband Report*, the FCC's broadband speed test will not capture any reduction in the speed of content from a particular provider or particular network. First, the test was designed to select the SamKnows node "with the lowest round trip time to test against." Thus, since the FCC speed test measured speeds to multiple off-net SamKnows

publicly available consumer satisfaction surveys suggests that larger cable companies get *lower* ratings from customers than do smaller cable companies.

(104) I analyzed the following four sets of consumer ratings:

1. *Consumer Reports*' ratings about consumers' experiences with triple-play bundles (TV, Internet, and phone with long-distance service), collected online during the Consumer Reports' Spring 2013 Annual Telecom Survey;
2. *J.D. Power and Associates*' scores from the 2012 US Residential Internet Service Provider Satisfaction Study;
3. *PC Magazine*'s 2012 Broadband ISP Overall Satisfaction ratings;
4. The *American Customer Satisfaction Index* (ACSI) for ISP companies for 2013 and 2014

(105) Figure 6 reports these consumer satisfaction ratings. Comcast's (the largest ISP) and TWC's (the third largest, behind AT&T when considering both its fiber and DSL subscribers) ratings are consistently at the lower end of the rating distribution.¹²¹ More broadly, the data do not support the thesis that larger ISPs perform better in terms of customers' satisfaction—rather to the contrary, as I describe below.

nodes, but only recorded the fastest return time, any congestion on a particular path would be ignored. *See FCC, 2014 Measuring Broadband America: A report on Consumer Fixed Broadband Performance in the U.S. – Technical Appendix*, at pg. 23, available at <http://data.fcc.gov/download/measuring-broadband-america/2014/Technical-Appendix-fixed-2014.pdf>. Second, as the report acknowledged, the “existing policy is to exclude measurements from our Report known to have been collected from a degraded measurements infrastructure affecting our testing.” *See FCC, 2014 Measuring Broadband America: A report on Consumer Fixed Broadband Performance in the U.S.*, 2014, at 35, available at <https://www.fcc.gov/reports/measuring-broadband-america-2014>. Thus, the speed consequences of degradation that occurred at interconnection points affected by interconnection disputes were eliminated from the test results.

¹²¹ In her June 11, 2014, white paper, Diana L. Moss of the American Antitrust Institute observes: “Poor consumer satisfaction rankings stand oddly in contrast to Comcast-TWC’s claims in its FCC application that Comcast is the leading innovator in cable TV and broadband Internet.” *See* Diana L. Moss, “Rolling Up Video Distribution in the U.S.: Why the Comcast-Time Warner Cable Merger Should Be Blocked,” American Antitrust Institute, June 11, 2014, at 7–8, available at https://www.antitrustinstitute.org/sites/default/files/AAI_CC-TWC%20White%20Paper_6-11.pdf.

Dr. Moss bases her statement on ACSI 2013 and Consumer Reports ratings reported in Figure 6. The other ratings in Figure 6 provide further support to Dr. Moss’ point.

Figure 6. Consumer satisfaction ratings

Company and technology (broadband subscribers, M*)	Consumer satisfaction rating				
	Consumer Reports	JD Power & Associates**	PC Magazine	ACSI 2013***	ACSI 2014***
Comcast (20.6 M)	59	631.75	7.6	62	57
TWC (11.6 M)	59	639.5	7.2	63	54
AT&T, DSL (5.7 M)	58	659.75	6.1	NA	NA
AT&T, U-Verse (10.7 M)	65		7.6	65	65
Verizon DSL (3.8 M)	59	659.67	6.4	NA	NA
Verizon FiOS (5.2 M)	69		8.9	71	71
CenturyLink (6.0 M)	63	628.33	6.6	64	65
Cox (4.7 M)	64	658.67	8.1	68	64
Charter (4.6 M)	62	614.67	7.5	65	61
Cablevision (2.8 M)	64	649	7.8	NA	NA
Bright House Networks (1.8 M)	69	684	7.8	NA	NA
SuddenLink (1.1 M)	71	651	7	NA	NA
Mediacom (1.0 M)	56	569	6.4	NA	NA
WOW (0.7 M)	74	707	8.4	NA	NA
<p>* Size is defined as the number of broadband subscribers (millions) in 4Q2013, as reported by SNL Kagan. As SNL Kagan reports total subscribers, the breakdown of AT&T and Verizon subscribers by technology (DSL vs. fiber) is based on public statements by each company.</p> <p>** JD Power & Associates ratings are reported by company and region (East, West, South, North Central). Entries for multiregion operators (Comcast, TWC, AT&T, Verizon, CenturyLink, Cox, and Charter) are simple (i.e., unweighted) averages of regional ratings over three or four regions (depending on ISP presence).</p> <p>*** ACSI ratings are available for large ISPs only. For AT&T and Verizon, ratings are available only for fiber-based ISP services.</p>					
Summary of ratings	Consumer Reports	JD Power & Associates	PC Magazine	ACSI 2013	ACSI 2014
Range of possible ratings	0-100	0-1000	0-10	0-100	0-100
Range of actual ratings	56-74	569-707	6.1-8.9	62-71	54-71
Average	63.71	646.03	7.39	65.43	62.43
Standard deviation	5.20	33.17	0.79	2.87	5.23
Number of observations	14	12	14	7	7
Correlation Rating - Size	Consumer Reports	JD Power & Associates	PC Magazine	ACSI 2013	ACSI 2014
Ratings by co. & tech.†	-40.5%	NA	3.0%	-66.9%	-61.2%
Ratings by co. ††	-48.2%	-6.6%	-6.7%	NA	NA
<p>† These correlations are calculated considering AT&T U-Verse (fiber) rating; AT&T U-Verse subscribers and AT&T DSL rating; AT&T DSL subscribers as two separate companies; similarly, Verizon FiOS and Verizon DSL are considered as separate data points. Of course, when only the fiber service ratings are available (ACSI ratings), only one data point for AT&T and Verizon, respectively, enters the calculation, with the associated number of fiber (U-Verse or FiOS) subscribers.</p> <p>†† Calculated after combining the technology-specific ratings for AT&T and Verizon into a single average rating for each company (by using subscribers as weights). Hence, the correlations are for Consumer Reports and JD Power and Associates ratings are based on two fewer observations (12 instead of 14) as compared to the correlations by company and technology in the row above.</p>					

- (106) While cognizant of the risks of making too much of limited data sets based on surveys, I believe it is appropriate to offer some formal statistical evaluation of the empirical relationship between consumer satisfaction reports and ISP size. To this end, I estimated simple regressions (one for each set of ratings) in which the dependent variable is the consumer satisfaction rating (in levels) and the explanatory variables are the ISP size (in millions of subscribers) and a constant.
- (107) Figure 7 summarizes the results of regressions, one for each survey, correlating the ratings by company *and* technology (i.e., including AT&T's and Verizon's DSL and fiber ratings as separate observations), with size (subscribers counts).
- (108) The last row of Figure 7 reports the probability value (p-value) of one-sided tests of a null hypothesis that satisfaction is unrelated to size. That is, for each regression, it reports the probability of the estimated coefficient on SIZE, b , being no greater than (at least as negative as) the estimate b^* actually obtained from the data, calculated on the assumption that the true SIZE coefficient β is equal to 0.
- (109) A one-sided test is appropriate here because the goal is to evaluate whether the data are consistent with the optimistic view (here, treated as a compound null hypothesis) that larger ISPs are better for consumers than are smaller ISPs; thus, observing a positive in-sample correlation would not be evidence against the null hypothesis, and thus, the positive tail should not be part of the zone for rejecting that hypothesis.
- (110) If the true SIZE coefficient β were strictly positive, then a negative estimated coefficient would be even less likely to occur than that calculation suggests. Thus, finding a low enough p-value to reject the null hypothesis of a zero relationship would *a fortiori* enable one to reject a null hypothesis of a strictly positive relationship.
- (111) Figure 7 illustrates that in three of the four regressions, though not in the *PC Magazine* ratings (the only one in which the estimated coefficient is positive), this p-value is 7.5% or less.¹²²

¹²² In the *Consumer Reports* regression, a White test shows that the null hypothesis of homoskedastic errors can be rejected at the 10% level. After applying a correction for heteroskedasticity (robust errors), the p-value for the one-sided test decreases from 7.5% to 4.1%.

Figure 7. Regression results—Dependent variable: ratings by company and technology

	Consumer satisfaction rating			
	Consumer Reports	PC Magazine	ACSI 2013	ACSI 2014
Number of observations	14	14	7	7
R ²	0.1640	0.0009	0.4480	0.3741
Coefficient on SIZE (two-sided t-stat probability)	-0.4035 (15.1%)	0.0046 (91.8%)	-0.3538 (10.0%)	-0.5892 (14.4%)
One-sided t-stat probability: Prob($b \leq b^* \mid \beta = 0$)	7.5%	54.1%	5.0%	7.2%
Note: In this setup, R ² is equal to the square of the correlation coefficients reported in Figure 6 for all regressions except the "combined rescaled rating" regression.				

- (112) While the data sets are small and the ratings scales are subjective and thus potentially noisy, those factors would normally be expected to militate against statistically significant findings. In short, the customer satisfaction data suggest reasonably strongly that in the cross-section, large ISPs are not better for customers, as evaluated by the customers themselves. Because much of the size variation among major ISPs comes from previous mergers, swaps, and consolidations, there is no clear reason to think that the proposed increase in size through a merger will be more favorable for customers.
- (113) Regressions correlating ratings *by company* to size also yield results that support the rejection of the hypothesis that there exists a positive relationship between consumer satisfaction and size.
- (114) Figure 8 summarizes the results of these regressions (i.e., including a single observation for AT&T and Verizon, calculated as explained in the notes to Figure 6).

Figure 8. Regression results—dependent variable: ratings by company

	Consumer satisfaction rating		
	<i>Consumer Reports</i>	JD Power & Associates	<i>PC Magazine</i>
Number of observations	12	12	12
R ²	0.2326	0.0043	0.0044
Coefficient on SIZE (t-stat probability)	-0.3838 (11.2%)	-0.3486 (84.0%)	-0.0062 (83.7%)
One-sided t-stat probability: Prob($b \leq b^* \mid \beta = 0$)	5.6%	42.0%	41.8%
Note: In this setup, R ² is equal to the square of the correlation coefficients reported in Figure 6 for all regressions except the "combined rescaled rating" regression.			

- (115) The p-value is 5.6% for one set of ratings (*Consumer Reports*).¹²³ For the two sets of ratings in which p is about 40%, the estimated coefficients are negative but statistically very insignificant.
- (116) Given the nature of the data, I do not wish to make too heavy an econometric meal of it, but ordinary principles of statistical inference would suggest that one can learn more from several borderline statistically significant findings than one would out of any one of them.
- (117) In view of the qualitative nature of the data, one cannot directly say how economically substantial the estimated negative relationships between size and customer satisfaction are. But if those estimated negative relationships were economically unimportant, it would follow that any economically important positive relationship would involve a positive coefficient β that is larger in magnitude than are the estimated negative coefficients b^* . For instance, if one writes B for the threshold of economic importance, then the theory that larger ISPs satisfy their customers better than smaller ones to an economically important degree amounts to the hypothesis that the true value of β is positive and at least equal to B. Given that in the sample we see a negative relationship, the evidence against the hypothesis that β is at least B (where $B > 0$) is stronger than the evidence against the hypothesis that β is at least 0, which is what I tested above. And if it were suggested that the magnitude of the estimated negative relationship, b^* , was economically unimportant, then it would follow that $|b^*| < B$, so that the evidence against the hypothesis that $\beta > B$ is stronger than the evidence against the hypothesis that $\beta > |b^*|$, which in turn is very considerably stronger than the evidence against the hypothesis that $\beta > 0$.
- (118) In summary, available consumer satisfaction data does not comfortably fit the optimistic view that large consumer ISPs better satisfy their customers. In the data above, the statistical incompatibility is borderline: some versions independently reach statistical significance at well below the 10% level,

¹²³ In the *Consumer Reports* regression, a White test shows that the null hypothesis of homoskedastic errors can be rejected at the 10% level. After applying a correction for heteroskedasticity (robust errors), the p-value for the one-sided test decreases from 5.6% to 4.3%.

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and estimated positive coefficients are the exception and the weakest patterns. The Commission may have access to more and better data, but at this point, it seems reasonable to say that the customer satisfaction data are against the view that big is good.

V. Comcast and TWC already have market power over content providers in providing access to their consumer subscribers

V.A. Methods for delivering Internet content to consumers

- (119) There are two basic types of contracts for exchanging Internet traffic—peering and transit. As Mr. Kilmer explains, under a *peering* agreement, the two networks agree to exchange traffic that originates with the customer of one network and terminates with the customer of the other network. The two networks, however, will not transport traffic from the customer of one peered network and transport it to a third network with which the first network has a peering arrangement.¹²⁴ In some peering agreements, the two networks agree to exchange traffic on a settlement-free basis, hence the name settlement-free peering.¹²⁵ Under a *transit* agreement, in contrast, a customer, which may be a network, agrees to pay another network to have the customer’s traffic transported to or from anywhere on the Internet. Thus, unlike in a peering relationship, under a transit arrangement, the network selling the transit services will route traffic from the transit customer to and from its peering partners.¹²⁶
- (120) Content and applications providers use different methods for delivering content or data to their end-user customers. I briefly discuss three of these methods below.

V.A.1. Transit

- (121) As explained in the Kilmer declaration, under a transit arrangement, the content provider pays a network to deliver its content to end-user subscribers regardless of the network to which they are connected.¹²⁷ Prices for paid transit are privately negotiated, and networks can expand capacity at costs that have fallen steeply.¹²⁸ These costs and competitive conditions have driven transit prices steadily downward as technology has improved.¹²⁹

¹²⁴ Kilmer Decl., ¶ 12.

¹²⁵ Kilmer Decl., ¶ 10.

¹²⁶ Kilmer Decl. ¶ 12. *See also* William B. Norton, *Internet Peering Playbook: Connecting to the Core of the Internet* (DrPeering Press, 2014), 7.

¹²⁷ Kilmer Decl. ¶ 12. *See also* William B. Norton, *Internet Peering Playbook: Connecting to the Core of the Internet* (DrPeering Press, 2014), 7.

¹²⁸ Kilmer Decl., ¶ 33 (“This decline in price was facilitated by a decrease in the cost of expanding network capacity.”) *See also* William B. Norton, *Internet Peering Playbook: Connecting to the Core of the Internet* (DrPeering Press, 2014), 12–13, 17.

¹²⁹ Kilmer Decl. ¶¶ 31, 33–34.

V.A.2. Content delivery networks

- (122) As the Kilmer declaration explains, content delivery networks (“CDNs”) are networks of servers that facilitate the distribution of Internet content. CDNs locate servers with the content as close as possible to the networks whose customers are using the content. Content providers contract with CDNs to store the provider’s frequently requested content on the CDN’s servers located close to the end-user customer.¹³⁰

V.A.3. Direct interconnection with consumer ISPs

- (123) Recently, certain large content providers have begun to act as their own CDNs. They enter into an agreement with an ISP, such as a cable company, under which the ISP agrees to interconnect directly with the content provider and, in some cases, to install servers within the ISP’s network where the content provider can store content close to its end-user customers.¹³¹

V.B. Comcast and TWC market power on the consumer side implies market power for the delivery of Internet content to subscribers

- (124) Although a content provider generally has multiple ways of getting content to the consumer ISP, there is no effective way of bypassing the consumer’s ISP. That fact gives the consumer’s ISP substantial market power over the delivery of content to the consumer. A consumer ISP has market power over content providers for the provision of access to its broadband subscribers. By this I mean that content providers and interconnecting networks will find it difficult to find alternate ways of delivering content to the subscribers of a consumer ISP when faced with access charges to deliver content that are higher than those charged by other ISPs or that they view as too high.
- (125) Even when an ISP has little market power on the consumer side of the market, it can be that the ISP could act as a monopolist over access to its subscribers.¹³² This is the case if content providers and connecting networks take as given the consumer’s choice of ISP, regardless of how much or little choice the consumer had in selecting that ISP.
- (126) In principle, content providers or connecting networks unhappy with being charged too much for access could try to persuade their customers (who may or may not be paying customers) to switch to a different ISP. While possible in theory,¹³³ such a strategy is unlikely to be successful if the ISP has

¹³⁰ Kilmer Decl. ¶ 27.

¹³¹ See, e.g., Kilmer Decl. ¶ 38; Ken Florance, “Announcing the Netflix Open Connect Network,” *Netflix US & Canada Blog*, June 4, 2012, <http://blog.netflix.com/2012/06/announcing-netflix-open-connect-network.html>.

¹³² Mark Armstrong, “Competition in Two-Sided Markets,” *RAND Journal of Economics* 37, no. 3 (2006): 668–91.

¹³³ As the economic literature has explored, the pattern of prices across both sides of a two-sided market, as well as the overall level of pricing generally matters in such markets. The principal exception is when there are sufficiently flexible

any significant market power on the consumer side. If consumers are unlikely or slow to switch ISPs, even in the face of differences in charges directly to them, then it is unlikely that they will do so promptly and in large numbers at the behest of a content provider that is subject to higher access charges by one ISP than by a rival ISP. And that is what it would take for consumer-level substitutability to limit ISP market power in access.

- (127) Many content providers do not charge their users, so their systems are not readily set up to offer a financial incentive for consumers to switch ISPs. Among those that do, many would not find it practical to tailor their charges to differences in access charges imposed by their users' ISP. {{ [REDACTED] }} And an ISP with substantial market power over content providers might well seek to impose "non-discrimination" requirements discouraging such a response even where feasible. Moreover, there are many content providers, and to the extent that each is reluctant to implement ISP-specific pricing, but would like to induce users to switch away from an ISP that charges higher access fees, a public-goods problem would arise among the content providers. If a content provider can induce consumers to switch ISPs, this creates a positive externality for all of the content providers that pay the high access fees. Thus the aggregate effort among content providers to induce consumers to switch would be lower than if content providers were able to consolidate their efforts. In short, the content suppliers would be unlikely to pass additional Comcast access charges fully to Comcast subscribers.
- (128) Faced with slowed delivery of its content to customers of certain ISPs, Netflix responded in certain ways that one would expect to strengthen end-users' willingness to substitute away from those ISPs. As described in the following section, Netflix publishes a speed index for each ISP that offers subscribers information on the average speed that they can expect from a particular ISP.¹³⁴ In addition, for a short period of time, when connection speeds were particularly slow on Verizon, a message would appear on the Netflix user's screen that said that the poor viewing experience was due to congestions on Verizon's network; Netflix removed these messages after Verizon sent it a cease-and-desist letter demanding that the notices stop.¹³⁵

pricing arrangements between the two sides so that any change in the pattern of pricing would be defeated by an adjustment in payments between the two sides themselves. As explained below, this exception almost certainly does not apply to the case for consumer ISPs.

¹³⁴ Netflix, "The ISP Speed Index from Netflix," accessed Aug. 1, 2014, <http://ispspeedindex.netflix.com/>.

¹³⁵ See Brian Fung, "Netflix: We'll Drop the Anti-Verizon Error Messages. For Now," *The Switch* (blog), June 9, 2014, <http://www.washingtonpost.com/blogs/the-switch/wp/2014/06/09/netflix-well-drop-the-anti-verizon-error-messages-for-now/>. This Washington Post blog entry refers to a Netflix blog entry dated June 9, 2014, stating that: "As part of this transparency campaign, we started a small scale test in early May that lets consumers know, while they're watching Netflix, that their experience is degraded due to a lack of capacity into their broadband provider's network. We are testing this across the U.S. wherever there is significant and persistent network congestion. This test is scheduled to end

- (129) While the Netflix speed index was widely reported on, it does not appear to have deterred a number of ISPs, including Comcast and TWC, from both declining to join Netflix’s Open Connect and then allowing the interconnection points employed by Netflix to become congested.¹³⁶

V.C. Recent interconnection disputes provide evidence that Comcast, TWC, and other large consumer ISPs do not face vigorously quality-elastic subscriber demand

- (130) Recently the subscribers of some consumer ISPs, including Comcast, have experienced significant slowing of content delivery for Netflix. Delivery speed later improved for Comcast subscribers, but it appears that it did so only after Netflix agreed to pay Comcast for access. The data analysis I present in this section suggests that the significant slowing of content delivery for Netflix was related to an interconnection dispute that resulted in congestion at the interconnection points between Cogent and some large consumer ISPs, including Comcast.¹³⁷ It appears that the congestion could have been remedied by adding port capacity at the congested interconnection points, as other ISPs did. Thus the evidence appears consistent with Comcast engaging in tougher bargaining with Netflix and Cogent than other ISPs were able or daring enough to do, and with an outcome that appears better for Comcast than the outcomes that smaller ISPs emerged with.
- (131) One can interpret this fact pattern as indicating (a) that Comcast had more bargaining power than smaller ISPs; and (b) that as part of its relatively tough bargaining strategy, Comcast was willing to sacrifice—not permanently but over a nontrivial period of time—its subscribers’ user experience. I would encourage the FCC to ask whether, consistent with this, Comcast did not hemorrhage users when it failed to deliver consumers’ requested content as speedily as other ISPs, as a firm facing fierce consumer-side competition would have done.¹³⁸

on June 16. We will evaluate rolling it out more broadly.” For the full Netflix blog entry, *see* Joris Evers, “Netflix ISP Speed Index for May,” *Netflix US & Canada Blog*, June 9, 2014, http://blog.netflix.com/2014_06_01_archive.html.

¹³⁶ Netflix’s Open Connect is a CDN with a single purpose of providing connectivity to Netflix. By joining Open Connect, ISPs can alleviate the congestion of other interconnection points because the traffic is shifted to the Open Connect system. Netflix’s Open Connect is discussed further in ¶ (132) below.

¹³⁷ Netflix used Cogent to deliver content to Comcast and the other large ISPs. There is evidence suggesting that the interconnection points between the large consumer ISPs and other transit providers were also congested. *See, e.g.*, Mark Taylor, “Verizon’s Accidental Mea Culpa,” *Beyond Bandwidth* (blog), July 17, 2014, <http://blog.level3.com/global-connectivity/verizons-accidental-mea-culpa/>.

¹³⁸ *See, e.g.*, Israel Decl., ¶ 81.

V.C.1. Congestion at Cogent's interconnection points with large consumer ISPs

- (132) Netflix, like other Internet content providers, uses a number of ways to deliver content to consumers. In June 2012, Netflix announced its Open Connect system.¹³⁹ The Open Connect system is essentially a CDN that is owned and operated by Netflix itself. According to the announcement, Netflix had been using general-purpose commercial CDNs to deliver content. The announcement and associated informational website essentially invited consumer ISPs to connect to Open Connect through a settlement-free peering arrangement.¹⁴⁰
- (133) I understand from Netflix that, by late 2013, small and mid-sized ISPs such as Cablevision, RCN, and Cox had signed up for Open Connect, but the largest ISPs, such as Comcast, TWC, AT&T, and Verizon, had not. To deliver its content to consumer ISPs that had not arranged an Open Connect interconnection, Netflix began to use Cogent (and, I am told, other transit providers) to replace at least some of its reliance on commercial CDNs. As a result, Internet traffic between Cogent and the large consumer ISPs not using Open Connect significantly increased.
- (134) Efficient delivery of the increased traffic required an increase in capacity at Cogent's interconnection points with those ISPs. Increasing interconnection capacity requires both sides to add ports to their respective side of the interconnection point. I understand that it is considered good practice to begin the process of augmenting port capacity when an interconnection point reaches 70% of capacity.¹⁴¹ Once a port reaches 90% of capacity, the interconnection point begins to exhibit packet loss—the loss of some of the information that is being sent over the interconnection point.¹⁴² As will be shown using data from Cogent, after Netflix began using Cogent as a transit provider, Cogent's interconnection points with a number of the large consumer ISPs surpassed 70% and 90% capacity utilization. With the exception of Comcast, this congestion persisted to the end of my data series in April 2014.
- (135) In Figure 9 and Figure 10, I have graphed the flow of traffic through two of Cogent's ports during a 24-hour period. Figure 9 depicts a pattern typical in the data for ports that are not operating close to capacity, where volume of outbound traffic (traffic from Cogent to the consumer ISP) peaks during the evening hours. Figure 10 depicts a pattern typical in the data for ports where the port cannot accommodate all of the traffic that is attempting to pass through it.

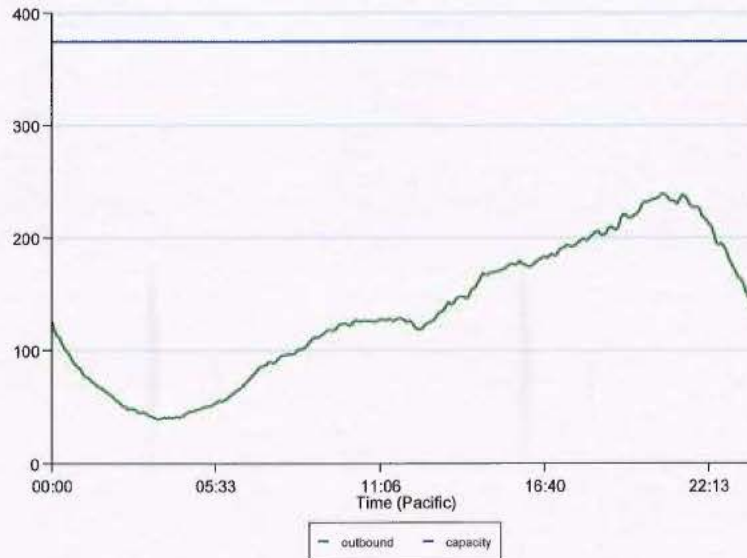
¹³⁹ See Ken Florance, "Announcing the Netflix Open Connect Network," *Netflix US & Canada Blog*, June 4, 2012, <http://blog.netflix.com/2012/06/announcing-netflix-open-connect-network.html>.

¹⁴⁰ See Netflix, "Netflix Open Connect Content Delivery Network," accessed July 31, 2014, <https://www.netflix.com/openconnect>. According to this webpage, a consumer ISP could also install a Netflix server directly to its system rather than connect at one or more of a number of interconnection locations.

¹⁴¹ Kilmer Decl., ¶ 16.

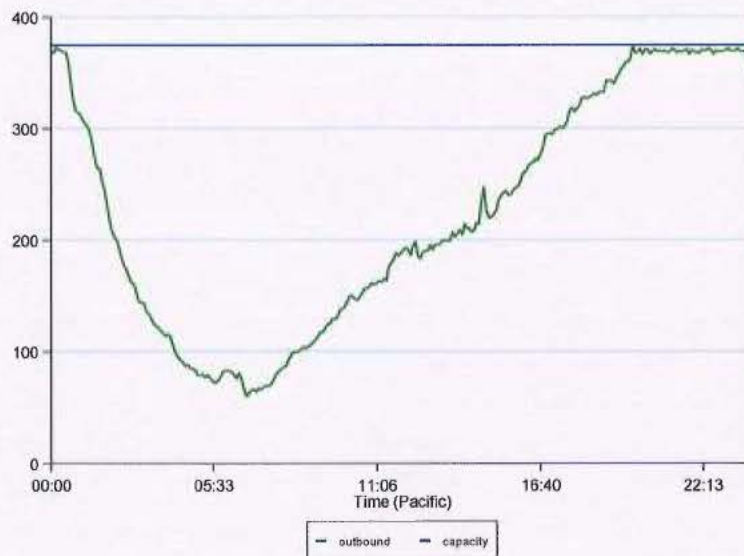
¹⁴² Kilmer Decl., ¶ 16.

Figure 9. Outbound traffic levels for a single port and day (capacity unconstrained)



Source: Cogent SSDG data.

Figure 10. Outbound traffic levels for a single port and day (capacity constrained)



Source: Cogent SSDG data.

- (136) In order to evaluate the capacity utilization at Cogent's interconnection points with consumer ISPs, I constructed two congestion indices for each ISP that measure on a monthly basis the percent of the day that the ISP's interconnection points with Cogent are utilized more than 70% and more than 90% of capacity. The 70% and 90% congestion indices are constructed using data from Cogent that reports the amount of traffic passing through each interconnection port every 5 minutes.¹⁴³ Knowing the capacity of each port allows me to calculate the percentage of capacity utilization for each 5-minute interval in a day and aggregate up to calculate the average period of time in a month that the interconnection points with a particular consumer ISP is utilized more than 70% and more than 90%.
- (137) Figure 11, Figure 12, Figure 13, and Figure 14 contain graphs of these indices. In the fall of 2012, Cogent experienced increased congestion at its interconnection points with AT&T, Comcast, CenturyLink, TWC, and Verizon. In contrast, interconnection points with Cablevision, Charter, and Cox remained relatively uncongested despite the fact that Charter and Cox experienced percentage increases in traffic from Cogent that were similar to the large consumer ISPs.¹⁴⁴ The data from Cogent suggest that Charter and Cox added sufficient capacity to accommodate the increase in traffic from Cogent but that AT&T, Comcast, CenturyLink, TWC, and Verizon did not.
- (138) The decrease in congestion for Comcast in March 2014 followed an agreement between Comcast and Netflix in which Netflix pays Comcast for a direct connection to its network,¹⁴⁵ thus reducing the Netflix traffic carried by Cogent bound for Comcast customers.¹⁴⁶ As I understand, this outcome is essentially similar to Open Connect with the key difference that Netflix pays Comcast for connecting to its network.

¹⁴³ Although the 70% figure is labeled as a congestion index, I note that this statistic does not represent a congested connection; instead, it is the point in a typical peering arrangement when discussions occur to add capacity. *See* Kilmer Decl., ¶ 16.

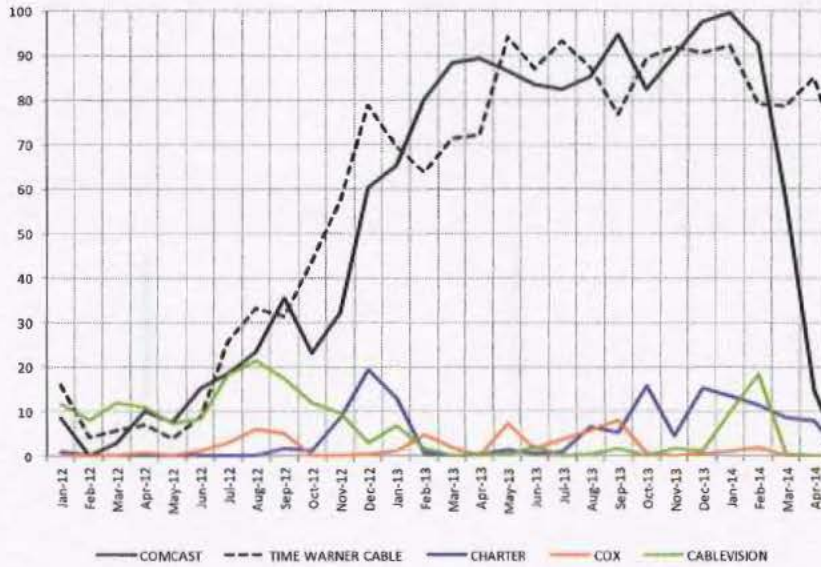
¹⁴⁴ By using the data from Cogent, I was able to calculate the percentage increase in traffic delivered to each of the consumer ISPs from July 2012 to July 2013, which roughly matches up with the period when for some of the ISPs congestion increased from a minimal level to a fairly significant portion of the day. These percentage increases in traffic are as follows. AT&T: 281%; Cablevision: -5%; Charter: 246%; Comcast: 223%; Cox: 144%; TWC: 96%; and Verizon: 83%.

¹⁴⁵ *See* Edward Wyatt and Noam Cohen, "Comcast and Netflix Reach Deal on Service," *New York Times*, Feb. 23, 2014, http://www.nytimes.com/2014/02/24/business/media/comcast-and-netflix-reach-a-streaming-agreement.html?_r=1.

¹⁴⁶ It is reported that Netflix signed paid interconnection deals with Verizon in the spring of 2014 and with AT&T and TWC in the summer of 2014, but congestion for Verizon shows no real signs of easing through April 2014, the period for which I have data. For Verizon, *see* Jon Brodtkin, "Netflix Pays Verizon for Network Connection to Speed up Video," *Ars Technica*, Apr. 28, 2014, <http://arstechnica.com/tech-policy/2014/04/netflix-and-verizon-reach-interconnection-deal-to-speed-up-video/>. For AT&T, *see* Jon Brodtkin, "AT&T Might Fix Netflix Problems for its Customers before Verizon Does," *Ars Technica*, July 29, 2014, <http://arstechnica.com/business/2014/07/att-might-fix-netflix-problems-for-its-customers-before-verizon-does/>. For TWC, *see* James O'Toole, "Faster Netflix Streaming Coming to Time Warner Cable," *CNN Money*, Aug. 20, 2014, <http://money.cnn.com/2014/08/20/technology/netflix-time-warner-cable/>.

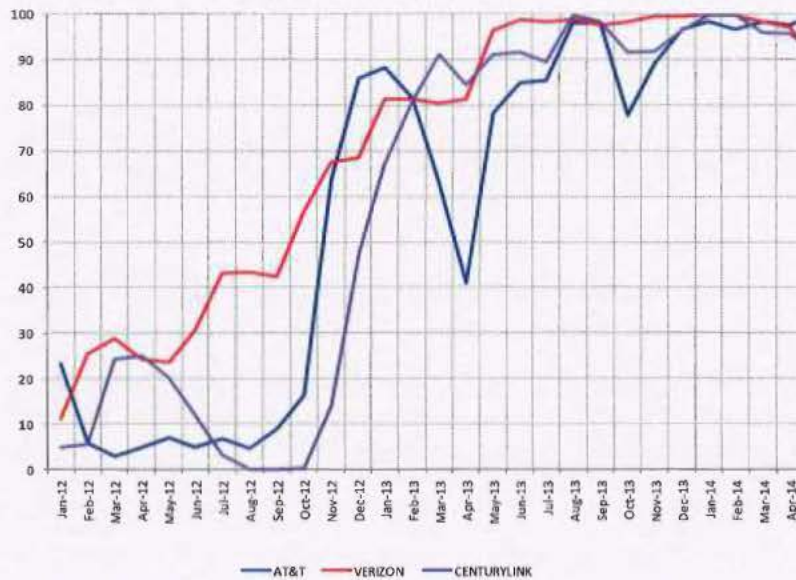
Recently the Chairman of the FCC asked to review these paid peering agreements between Netflix and the ISPs (in particular Comcast and Verizon). *See* FCC, "Statement by FCC Chairman Tom Wheeler on Broadband Consumers and Internet Congestion," news release June 13, 2014, <http://www.fcc.gov/document/chairman-statement-broadband-consumers-and-internet-congestion>.

Figure 11. Percentage of the prime time period when Cogent interconnection ports with selected cable companies are used at more than 70% port capacity



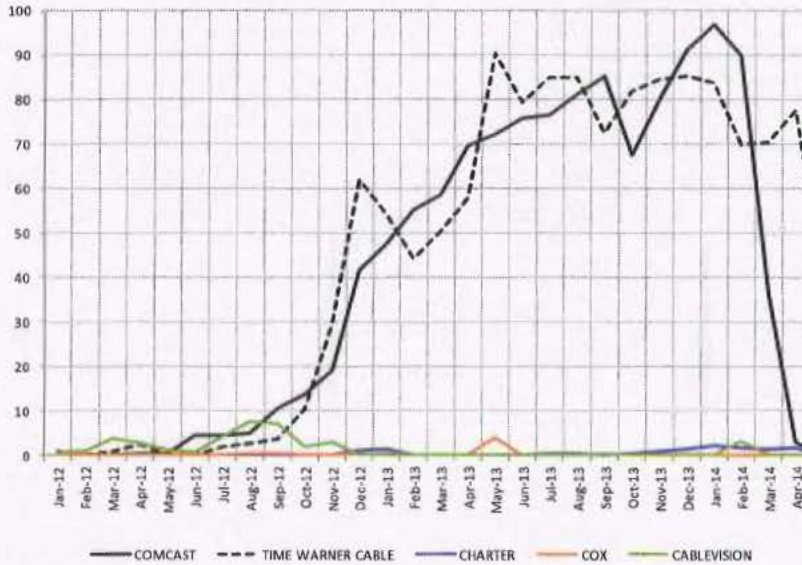
Source: Bates White calculations based on Cogent data.

Figure 12. Percentage of the prime time period when Cogent interconnection ports with selected telecoms are used at more than 70% port capacity



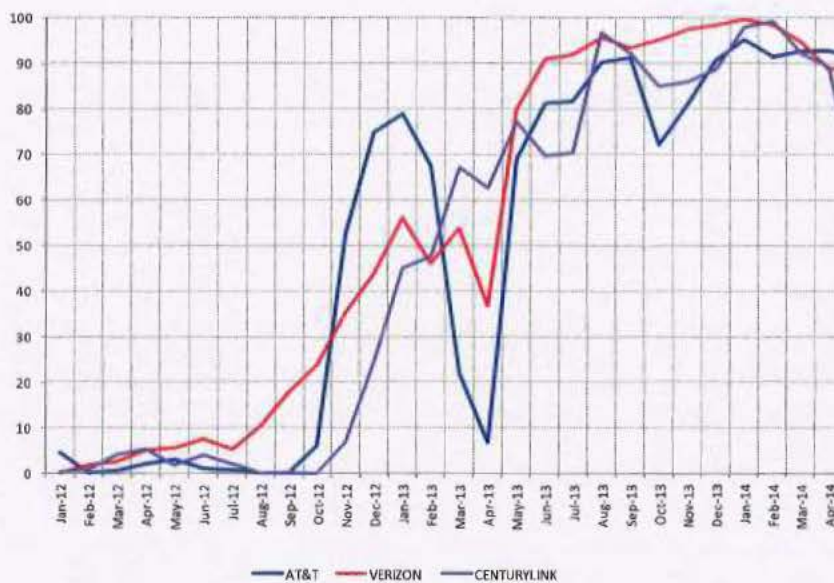
Source: Bates White calculations based on Cogent data.

Figure 13. Percentage of the prime time period when Cogent interconnection ports with selected cable companies are used at more than 90% port capacity



Source: Bates White calculations based on Cogent data

Figure 14. Percentage of the prime time period when Cogent interconnection ports with selected telecoms are used at more than 90% port capacity



Source: Bates White calculations based on Cogent data.

- (139) Cogent's requests for an increase in interconnection capacity were escalated in the spring and summer of 2013, when Cogent's General Counsel sent letters to large ISPs, including Comcast.¹⁴⁷ Comcast responded by suggesting that the interconnections would not be expanded on a settlement-free basis but could instead be on the basis of a "commercial" relationship.¹⁴⁸
- (140) Cogent also offered to pay for upgrading both sides of the interconnection.¹⁴⁹ I understand that none of the large consumer ISPs took Cogent up on that offer. Cogent estimates the cost of upgrading Comcast's interconnection points with capacity sufficient to relieve the congestion to be approximately \$120,000 for 12 new 10 Gbps ports and a monthly data center fee of \$2,400.¹⁵⁰ The cost of the 12 new ports is less than a cent per Comcast broadband subscriber. I understand from Cogent that no additional capacity has been added, and Cogent has not agreed to pay the large consumer ISPs.
- (141) This evidence suggests that these large consumer ISPs pursued a course of conduct (declining to add capacity) that risked degrading, and did degrade, their subscribers' user experience, compared to the course of conduct followed by at least some smaller consumer ISPs. The large consumer ISPs were not the only firms hurt by that degradation, and in at least some cases it appears that Netflix blinked first. This apparent tough bargaining on the part of the large consumer ISPs contrasts with the conduct of smaller consumer ISPs who chose instead to accept Netflix's Open Connect proposal and/or to upgrade their interconnections with Cogent. Whatever else it may show, this episode appears to support the view that larger ISPs are tougher and more powerful bargainers, and is evidence against Dr. Israel's view that large cable ISPs could not degrade, and/or would not risk degrading, their subscribers' user experience.¹⁵¹

V.C.2. Delivery speeds for Netflix content

- (142) Since October 2013, Netflix has been publishing data on the average download speed for Netflix content enjoyed by subscribers of sixteen major ISPs during primetime hours.¹⁵² Netflix has made available to me highly confidential data on average speed during prime time hours for these ISPs since January 2012. Figure 15 reports these highly confidential data in two separate panels: one for cable companies and the other for wireline telecommunications companies.¹⁵³

¹⁴⁷ Letter from Robert N. Beury Jr., Chief Legal Officer, Cogent, to Arthur R. Block, Senior Vice President and General Counsel, at Comcast, "Internet Peering with Cogent Communications" (June 14, 2013).

¹⁴⁸ Letter from Arthur R. Block, Senior Vice President and General Counsel, Comcast, to Robert N. Beury Jr., Chief Legal Officer, Cogent (June 20, 2013).

¹⁴⁹ Kilmer Decl., ¶ 68.

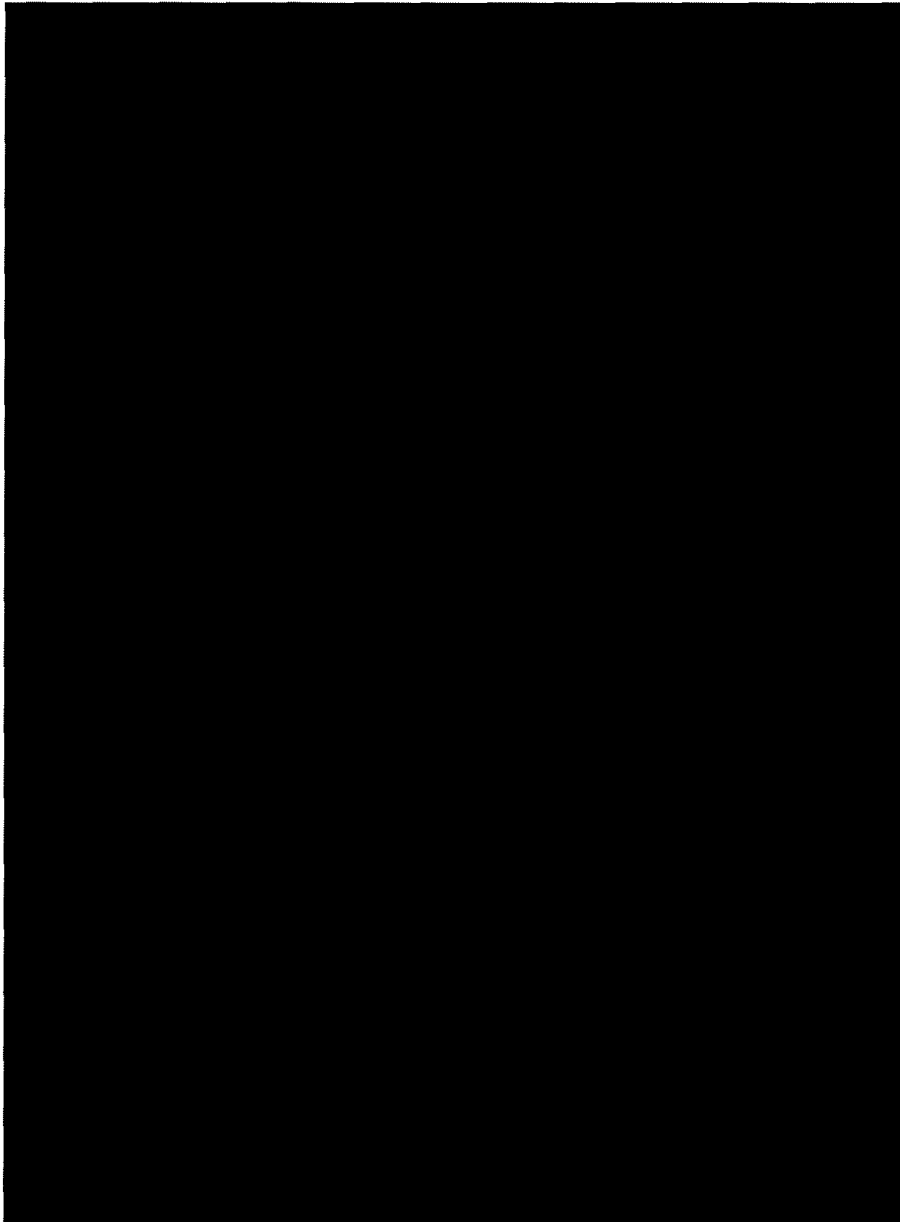
¹⁵⁰ Kilmer Decl., ¶¶ 19, 68.

¹⁵¹ Israel Decl., ¶ 81.

¹⁵² See Netflix, "The ISP Speed Index from Netflix," accessed Aug. 1, 2014, <http://ispspeedindex.netflix.com/>.

¹⁵³ {{ [REDACTED] }}

Figure 15. Netflix download speeds by ISP {{



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- (143) Figure 15 shows that in this quality dimension, the largest cable ISPs (Comcast and TWC) typically were outperformed by smaller consumer ISPs for some time; after the performance gap became even

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larger for some time in late 2013 and early 2014, there was an improvement in Netflix speeds, especially for Comcast—plausibly related to the paid interconnection agreement recently reached by the two companies.¹⁵⁴ A similar pattern applies to telecom carriers: for DSL connections, AT&T and Verizon trail smaller consumer ISPs, and the gap has been increasing lately. While the fiber-based access services of AT&T and Verizon used to outperform smaller consumer ISPs' DSL services (as one would expect from a technology standpoint), the gap largely disappeared in the last few months of this sample period.¹⁵⁵

V.C.3. Netflix delivery speeds seem to be related to congestion at Cogent's settlement-free peering points

- (144) The previous two subsections describe (Cogent) congestion and (Netflix) speed data for each of a number of ISPs. A natural expectation would be that congestion goes along with slower speeds. As I describe in the Appendix A, this expectation is borne out in simple linear regressions. These regressions use the monthly Netflix ISP-specific speed statistics as the dependent variable with one of the 70% and 90% congestion indices, a time trend, and fixed effects for each ISP as independent variables. Under a number of specifications, the estimated coefficient on the congestion index used is negative and significantly different from zero.

V.C.4. Implications for an analysis of large ISP market power

- (145) Based on the interconnection dispute described above, it appears that large consumer ISPs were willing to significantly degrade the quality of service (specifically of delivery of one type of content, Netflix, that likely is quite important to many subscribers) to their subscribers for a nontrivial period. Independent of the efficiency or welfare properties of such a strategy or of the paid direct connection that they may have been negotiating for (discussed below), the tactic appears inconsistent with Dr. Israel's argument that no ISP could dare risk degrading delivery of content because such an ISP would promptly lose dramatic numbers of subscribers.¹⁵⁶

¹⁵⁴ TWC entered into a paid peering agreement with Netflix in August 2014. Further improvement over the smaller ISPs by TWC could be the result of this new agreement with Netflix. See James O'Toole, "Faster Netflix Streaming Coming to Time Warner Cable," CNN Money, Aug. 20, 2014, <http://money.cnn.com/2014/08/20/technology/netflix-time-warner-cable/>.

¹⁵⁵ Verizon and AT&T have each entered into a paid peering agreement with Netflix to improve their performance of streaming. Netflix offered to pay the companies to increase the quality of performance. Further improvement over the smaller ISPs by AT&T and Verizon could be a result of these new agreements with Netflix. For Verizon, see Jon Brodtkin, "Netflix Pays Verizon for Network Connection to Speed up Video," Ars Technica, Apr. 28, 2014, <http://arstechnica.com/tech-policy/2014/04/netflix-and-verizon-reach-interconnection-deal-to-speed-up-video/>. For AT&T, see Jon Brodtkin, "AT&T Might Fix Netflix Problems for its Customers before Verizon Does," Ars Technica, July 29, 2014, <http://arstechnica.com/business/2014/07/att-might-fix-netflix-problems-for-its-customers-before-verizon-does/>.

¹⁵⁶ Israel Decl., ¶¶ 37, 81.

- (146) Even if the temporary decline in the quality of Comcast’s delivery of Netflix traffic were inadvertent or efficient—neither of which it appears to be—it can offer a test of Dr. Israel’s suggestion that any degradation in the delivery of content to Comcast subscribers would lead to so much loss of subscribers that Comcast would never allow such degradation to occur, or in shorthand that no such strategies need be feared because Comcast lacks “market power.”¹⁵⁷

¹⁵⁷ Israel Decl., ¶ 37.

VI. The merger is likely to cause an increase in leverage over content suppliers

- (147) Peering and transit arrangements between networks or between networks and Internet content providers are the product of bilateral negotiation between the interconnecting entities, as are direct interconnections between large consumer ISPs and content providers such as Netflix. As such, in economic terms it is natural to think of the prices and other commercial terms associated with these arrangements as being determined through a bargaining process.

VI.A. Economics of bargaining markets

VI.A.1. The theoretical bargaining literature suggests that merger effects could go in either direction

- (148) As Dr. Israel suggests, a theoretical literature on the relationship between size and bargaining leverage suggests that the effect of one party's size on its bargaining leverage depends on the shape (concave or convex) of the function that relates value created to the size of the customer base.^{158,159}
- (149) In theory, it is possible for the value function to be concave or convex. The theory thus helps us understand how various bargaining-power effects may operate but does not itself provide unambiguous predictions for whether a merger will increase or decrease bargaining leverage. But of course that does not imply that one cannot form an informed view on that question: it just means that more than that theory is required in order to do so.

VI.A.2. An alternate view suggests that mergers will never lead to a decrease in bargaining leverage

- (150) The theoretical bargaining literature assumes that the merging party must bargain jointly post merger rather than continue to bargain separately. However, if Comcast/TWC would be better off not integrating their bargaining, then it is not clear why they would do so.
- (151) If merging cable companies can choose whether or not to integrate their bargaining with content suppliers, then one might equally presume that the merged firm would choose to bargain in the way

¹⁵⁸ Israel Decl., ¶ 93.

¹⁵⁹ Tasneem Chippy and Christopher M. Snyder, "The Role of Firm Size in Bilateral Bargaining: A Study of the Cable Television Industry," *Review of Economics and Statistics* 81 (1999): 326–40.

that provides it with the most leverage. In such a case, a merger would never lead to a decrease in the merging parties' bargaining leverage.

- (152) Of course, if the merged firm would have more bargaining leverage by not integrating its bargaining with content suppliers, content suppliers might try to force the merged firm to integrate its bargaining. However, forcing integrated bargaining could be difficult if agreements are staggered in time and business units remain separate. In addition, forcing integrated bargaining on a large cable company that has set itself up to do business differently implies a degree of bargaining leverage that few Internet content suppliers are likely to possess. Most persuasively perhaps, if the merger reduced the parties' bargaining leverage with content suppliers, the Agencies would presumably be hearing from content suppliers that they support the merger rather than oppose it.
- (153) It may be that continuing to bargain separately would seem strange to industry participants. Some might be tempted to view this as a counter-argument suggesting that such an option is not really available to a merged firm. But if it is a fact that such bargaining does not occur and that industry participants would find it strange to bargain in such a way, part of the reason may well be that bigger cable companies systematically do have more bargaining leverage than smaller cable companies and that the strangeness is puzzlement at why a negotiator would not take advantage of available extra leverage.

VI.B. Empirical evidence suggests that a cable company's ability to charge for access to its subscribers increases with size

- (154) While the bargaining theory taken alone is inconclusive, available empirical evidence strongly suggests that a cable company's size increases its bargaining leverage, relative both to programming suppliers and (to the extent that evidence is available) to content providers, specifically concerning charging them for access to its subscribers.

VI.B.1. Industry participants largely regard this as obvious

- (155) Industry participants and analyst reports widely believe that large cable companies have an advantage in programming costs over new entrants and smaller cable and other MVPD providers, in part due to increased bargaining leverage.
- (156) For example, a January 2012 analyst report states, "Cable companies have an inherent advantage over newer entrants since they can leverage their existing platform and large user base to better negotiate contracts with content owners. Emerging players need to garner a much larger user base before attaining content as exemplified by Fox, NBC, CBS, and ABC blocking Google TV from accessing

streaming website content due to its small user base.”¹⁶⁰ An August 2012 report states that “‘must-have’ content providers have a negotiating advantage, though this advantage is partly offset by Comcast’s [pre-merger] sheer size.”¹⁶¹ Another analyst report uses the term “purchasing power” to describe Comcast as being “ideally positioned to monetize this [to push back against the rising cost of programming] as it is the largest MVPD in the country.”¹⁶²

- (157) According to the National Cable Television Cooperative, an organization that handles negotiations with content providers on behalf of small cable companies, “Smaller cable operators already pay higher per-subscriber fees than big operators, such as Comcast Corp., which have the leverage to negotiate volume discounts. Cable executives say the new Viacom agreement [with NCTC] would have meant paying more than a 100% increase from 2013 rates over the course of the five-year deal.”¹⁶³
- (158) Wunderlich Securities provided an estimate of per-subscriber monthly programming costs for Comcast and Cox in 2012. This analysis indicates that Cox’s per-subscriber monthly programming costs were significantly higher than Comcast’s.¹⁶⁴
- (159) Statements from the merging parties suggest that their increased size will result in lower programming costs. For example, the Comcast-TWC fact sheet states that the merger will result in “Benefits of Scale: The transaction will generate significant cost savings and other efficiencies, which will ultimately benefit consumers.”¹⁶⁵ Of these cost savings, Michael J. Angelakis, CFO at Comcast, wrote:

It is my view that the merger will result in significant annual cost savings that would be unachievable absent the transaction. The estimated efficiencies are approximately 10 percent of TWC’s operating expense base. Importantly, we expect that we will achieve \$750 million of the \$1.5 billion in operating efficiencies in the first year after closing, another 25 percent in year two, and the remaining 25 percent in year three. . . The remaining { [REDACTED] } million in operating expense efficiencies of the total \$1.5

¹⁶⁰ Amy Yong and Andrew DeGasperi, “Cable & Satellite: Getting its Swagger Back,” Macquarie Research, Jan. 9, 2012, at 528.

¹⁶¹ Jim Kelleher, “Weekly Staff Report,” Argus Research Company, Aug. 13, 2012, at 48.

¹⁶² Tony Wible and Murali Sankar, “Comcast Corporation: CMCSA - Buy,” Janney Capital Markets, Sept. 10, 2012, at 16.

¹⁶³ Shalini Ramachandran, “Viacom, 60 Cable Firms Part Ways in Rural U.S.,” *Wall Street Journal*, June 17, 2014, <http://online.wsj.com/articles/viacom-60-cable-firms-part-ways-in-rural-u-s-1403048557>. For more information on the NCTC, see Joan Engebretson, “Viacom NCTC Deal Reached, Avoiding Rural Cable Blackout,” *Telecompetitor*, Apr. 1, 2014, available at <http://www.tnics.com/media/viacomnctcdealreachedavoidingruralcableblackout.pdf>.

¹⁶⁴ Matthew Harrigan, “What Does the Cox Say?” Wunderlich Securities, Inc., Dec. 6, 2013, at Fig. 2; Matthew Harrigan, “Comcast May Have Unique Ability to Realize Big Apple and Los Angeles Value,” Wunderlich Securities, Inc., Nov. 25, 2013, at Fig. 28.

¹⁶⁵ Comcast, *Comcast and Time Warner Cable Transaction Fact Sheet*, Feb. 13, 2014, available at <http://corporate.comcast.com/images/Transaction-Fact-Sheet-2-13-14.pdf>.

billion are expected to come from savings on programming costs over a three-year period, to the extent and at such time as more favorable rates and terms in some of Comcast's programming agreements supersede some of TWC's existing contracts.¹⁶⁶

- (160) Furthermore, David L. Cohen, Executive Vice President at Comcast, stated at a House of Representatives Judiciary Committee hearing about the merger that he “can’t guarantee that prices are going to go down,” but that the transaction “has the potential to slow the increase in prices because with our additional scale, our additional investment, and our ability to gain some purchasing advantages in the set-top box market maybe be able to move the needle slightly on the programming side,” referring to Comcast’s ability to lower programming costs after the merger.¹⁶⁷
- (161) The ability to lower programming costs due to greater size is also discussed in the context of the proposed AT&T-DirecTV merger. For example, AT&T’s 8-K filing on June 3, 2014, stated:

AT&T expects cost synergies to exceed \$1.6 billion annual run-rate by three years after closing. . . . Programming cost reductions are the most significant part of the expected cost synergies. At this time, AT&T’s U-verse content costs represent approximately 60% of its subscriber video revenues. With the scale this transaction provides, we estimate AT&T’s U-verse content costs after the completion of the transaction will be reduced by approximately 20% or more as compared with our forecasted standalone content costs.¹⁶⁸

- (162) Another AT&T filing on June 11, 2014, states that “[l]ack of scale particularly hinders AT&T with respect to content acquisition, which is by far the largest variable cost of MVPD service. AT&T therefore faces challenges selling competitive broadband/video bundles even inside its U-verse video footprint” and that “AT&T has only one reliable option to lower its content costs in a reasonable time frame to compete effectively with Comcast: expand its customer base significantly.”¹⁶⁹

VI.B.2. Empirical studies in MVPD

- (163) The question of whether larger size is associated with better bargaining outcomes has been empirically investigated in the MVPD industry. In the MVPD industry, companies like Comcast bargain with content providers (companies like ESPN or HBO) over the programming fees that the

¹⁶⁶ Declaration of Michael J. Angelakis, *In re Applications of Comcast Corp. and Time Warner Cable Inc.*, No. 14-57 (FCC, Apr. 7, 2014), ¶ 7.

¹⁶⁷ United States House of Representatives Judiciary Committee, “Hearing: Oversight Hearing on ‘Competition in the Video and Broadband Markets: The Proposed Merger of Comcast and Time Warner Cable,’” recording available at <http://judiciary.house.gov/index.cfm/hearings?ID=301C520F-5B9E-4E43-B2B5-B131B3B88951>. For the Cohen statement, see 2:12:30–2:13:07 of the recording.

¹⁶⁸ AT&T, Current Report (Form 8-K) (June 3, 2014), ¶ 1.

¹⁶⁹ AT&T, Other Filing (Form 425) (June 11, 2014), at 3, 25.

distribution networks pay to content providers in order to be able to include the content providers' channels in pay TV plans that the distribution networks offer to end users.

- (164) Empirical studies on the MVPD industry are largely consistent with the view, widely shared among industry participants and observers, that increased size improves the bargaining outcomes for these MVPDs vis-à-vis programmers.
- (165) **An FCC staff report (2002)** described an experimental study to examine the effects of different levels of national concentration among Programming Distributors (PD) (whose size is measured by share of national subscribers) on bargaining outcomes with programming providers.¹⁷⁰ The authors ran three sets of laboratory experiments.¹⁷¹
- (166) The authors find that the share of the industry-wide gains from trade that the PDs receive as a group—about 45%, the rest going to programmers—is not related to the level of concentration among PDs. However, concentration does affect how that 45% is distributed among PDs; the authors find that “a particular cable operator's bargaining power [that is, the portion of the overall gains from trade it takes home] increases, up to a threshold point, with size.”¹⁷²
- (167) **Crawford and Yurukoglu (2012)** estimate a regression that relates programming fees to the size of the distribution network and find that size matters: Comcast, with about 24 million subscribers, faces input costs that are 17% lower than those of a small distributor. This result is obtained under the assumption that each distributor receives a uniform discount off programming fees from different program suppliers—i.e., if Comcast has a 30% discount on ESPN, then it also has a 30% discount on CNN.¹⁷³
- (168) **Ford and Jackson (1997)** take advantage of programming cost data that the FCC collected in the early 1990s to study the effects of cases when a Multiple-System Operator (“MSO”) adds a local franchise to its system on the prices that cable companies pay to independent programming companies.¹⁷⁴ The authors find that larger MSOs (by subscribers) pay lower prices to programming

¹⁷⁰ See Mark M. Bykowsky, Anthony M. Kwasnica, and William W. Sharkey, “Buyer Size and Bargaining Power: An Experimental Analysis,” FCC OPP Working Paper No. 35, 2002. The FCC carried out the study after a US Court of Appeals remanded the FCC’s horizontal limit prohibiting a single cable operator from serving more than 30% of the national subscribership for lack of evidentiary basis to support the threshold.

¹⁷¹ The experiments differed by the assumed concentration level on the buyers’ side: a low concentration/high number of PDs scenario (5 PDs, none with more than 30%); a high/low scenario (3 PDs, 39%-44%-17% shares); and a high/high scenario (5 PDs, one with 51%). See *Id.*, at 18.

¹⁷² See Mark M. Bykowsky, Anthony M. Kwasnica, and William W. Sharkey, “Buyer Size and Bargaining Power: An Experimental Analysis,” FCC OPP Working Paper No. 35, 2002.

¹⁷³ See Gregory S. Crawford and Ali Yurukoglu, “The Welfare Effects of Bundling in Multichannel Television Markets,” *American Economic Review* 102, no.2 (2011): 643–85. The paper’s goal is predicting the impact of mandating à la carte pricing on pay TV channels (instead of bundling, as commonly done) on consumer and producer welfare. The estimation of the relationship between distributor’s size and programming fees is instrumental to this goal.

¹⁷⁴ George S. Ford and John D. Jackson, “Horizontal Concentration and Vertical Integration in the Cable Television Industry,” *Review of Industrial Organization* 12 (1997): 501–18. The authors also estimate how the fact that an MSO

networks; in particular, they estimate that the average MSO pays 11% more than the largest MSO, and the smallest MSO pays 52% more than the largest MSO. The authors also find that the MSOs pass through to end users (in the form of lower subscription fees) about half of the discounts that the MSOs receive.

- (169) **Chipty (1995)** tests the hypothesis that large cable companies are able to pay lower per-subscriber programming fees to programmers than smaller cable companies. Given the lack of public data on negotiated programming fees, her test is based on the observation that if large firms have lower marginal costs than small firms, then large firms should be willing to “supply more” (have more subscribers, carry more channels) than small firms, all else equal.¹⁷⁵ In her regressions, Chipty includes controls for the cable *regional* size—another source of lower marginal costs, due to network economies of scale/density—and finds that the coefficient on *national* size—the proxy for bargaining power—is significant and positive in the regressions and explains how many basic cable subscribers a distributor has/how many channels a distributor includes in its non-basic bundles.
- (170) Dr. Israel instead focused solely on a paper by **Chipty and Snyder (1999)** that argues that an increase in size (i.e., a merger) could weaken a cable system’s bargaining position vis-à-vis programmers, depending on the convexity/concavity of the function relating the programmers’ advertising revenues to the size of the viewer base they can reach.¹⁷⁶ As noted above, that theoretical observation is correct within the bargaining framework adopted. However, the paper’s empirical result—the advertising function is S-shaped, with its convex portion corresponding to larger sizes (meaning larger cable system prefer not to get bigger via mergers)—is at odds with both industry participants’ views (see previous section) and the intuitive relationship between audience size and advertising revenues: Chipty and Snyder estimate the advertising function to be concave around size =0, but, as Armstrong and Crawford observe in an unpublished working paper: “This convexity seems at odds both with the institutional relationship between network size and advertising revenue (which limits the ability of networks to obtain advertising revenue at low subscriber levels) as well as claims made by industry participants and observers of the benefits of increased size.”¹⁷⁷
- (171) Bargaining and the effects of size on bargaining outcomes, have also been extensively studied in the health care industry. While of course this is more distant from the current context than is bargaining between cable companies and video programmers, it too can illuminate whether there are general forces, perhaps not captured in the bargaining framework described by Dr. Israel, that tend to make

produces its own programming (vertical integration) affects the prices the MSO pays for independent programmers’ channels.

¹⁷⁵ Tasneem Chipty, “Horizontal Integration for Bargaining Industry Power: Evidence from the Cable Television Industry,” *Journal of Economics & Management Strategy* 4, no. 2 (1995): 375–97.

¹⁷⁶ Tasneem Chipty and Christopher M. Snyder, “The Role of Firm Size in Bilateral Bargaining: A Study of the Cable Television Industry,” *Review of Economics and Statistics* 81, no. 2 (1999): 326–40.

¹⁷⁷ Mark Armstrong and Gregory S. Crawford, “The Economics of Television and Online Video Markets,” unpublished mimeo.

size an advantage. In addition, the health care context offers the potential to separate out the effects of size as such from the effects of eliminating competition between providers in the same market.¹⁷⁸

VI.B.3. Recent experiences from Cogent and Netflix have been that large cable companies extract better terms

- (172) Cogent has supplied me with information on its terms of interconnection with consumer ISPs. For the top cable ISPs, Appendix B reports the number of US subscribers (if available), whether or not the ISP has a settlement free peering arrangement with Cogent, and a transit price. Many of the transit contracts are nonlinear, involving a fixed price for up to a committed level of monthly usage and an incremental price for usage over the commitment level within a month. In Appendix B for a simplified transit price for each ISP, I report the average price that would prevail under the ISP's transit contract if the ISP used exactly its committed volume (the "average committed price").

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¹⁷⁸ **Gowrisankaran, Nevo, and Town** (forthcoming) estimate a structural bargaining model of competition between hospitals and managed care organizations (MCOs), using data from Virginia. The theoretical model shows how the incentives to merge at one stage of the vertical production chain depend on whether the bargaining counterpart(s) at the next stage view the prospective merging partners as (strategic) substitutes or complements. The authors use their estimates to simulate the effects of a proposed hospital acquisition that the FTC challenged and find that the merger would have significantly raised hospital prices. See Gautam Gowrisankaran, Aviv Nevo, and Robert Town, "Mergers When Prices Are Negotiated: Evidence from the Hospital Industry," *American Economic Review* (forthcoming), available at http://www.u.arizona.edu/~gowrisan/pdf_papers/hospital_merger_negotiated_prices.pdf.

Sorensen (2003) studies negotiations between insurers (buyers) and hospitals (sellers) to determine which insurers' characteristics explain the discounts off a hospital's list prices insurers achieve in negotiations. Sorensen finds that size confers bargaining power, after accounting for other reasons that could explain observed discounts, namely an insurer's ability to "channel patients" away from low-discount hospitals (which he finds to be relatively more important than size in determining discount magnitudes). See Alan T. Sorensen, "Insurer-Hospital Bargaining: Negotiated Discounts In Post-Deregulation Connecticut," *Journal of Industrial Economics* 51, no. 4 (2003): 469–90. Sorensen measures size as an insurer's total (across all hospitals) charges in a county.

Ellison and Snyder (2010) study the discounts that drugstores and hospitals/HMOs receive from antibiotics manufacturers. They find that chain drugstores receive no discount relative to small buyers on antibiotics with unexpired patents (monopoly antibiotics), but for off-patent antibiotics, chain drugstores receive a positive and statistically significant discount relative to independent pharmacies (about 2%). See Sara Fisher Ellison and Christopher M. Snyder, "Countervailing Power in Wholesale Pharmaceuticals," *Journal of Industrial Economics* 58, no. 1 (2010): 32–53.

Lewis and Pflum (2014) study negotiations between MCOs and hospitals, and ask how outcomes differ depending on whether the MCO is bargaining with a "non-system" individual hospital or a "system" multi-hospital firm. The authors assume that "system" firms controlling multiple hospitals negotiate a single contract, thereby giving the requesting MCO access to all member hospitals. The two-stage model separately estimates the impact of the two main channels through which system membership affects outcome. First, when a hospital joins a system, the MCO can no longer substitute one system member for another for patients that live close enough to all of these hospitals—an effect the authors label as a better "bargaining position." Second, system membership can improve the hospital's "bargaining power"—for instance, because of less risk aversion or benchmarking-type information—thus allowing the hospital to extract a higher share of the surplus generated. The authors find that this latter "bargaining power" channel—which is present even when merging hospitals are located in different patient markets—is significant: the additional average markup in the per diem reimbursement created by the system's additional bargaining power is about \$855 (or 23%), in contrast to the additional \$150 (or 4%) that is created by the stronger bargaining position when there are system members in the same market. See Matthew S. Lewis and Kevin E. Pflum, "Diagnosing Hospital System Bargaining Power in Managed Care Networks," *AER: Economic Policy* (forthcoming).

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- (175) While this data of course does not cover Cogent’s rivals, and while (as noted above) the contract pricing is in some cases complex, a pattern comes through that the largest ISPs have settlement-free peering while smaller consumer ISPs pay Cogent. Moreover, as described above, the largest consumer ISPs have recently seemed willing to bargain hard in order to insist on being paid for interconnection.
- (176) This pattern seems difficult to reconcile with a view that an ISP’s size has no systematic relationship with its bargaining power or with the terms of agreements that it will reach with interconnectors.
- (177) One test of greater bargaining power is if one party declines an offer that another accepts. The negotiations and events described in section V.C above showed a number of larger consumer ISPs declining Netflix’s proposed Open Connect, while a number of smaller consumer ISPs accepted it. Similarly, larger consumer ISPs declined Cogent’s proposals to expand capacity on interconnection ports, while some smaller consumer ISPs agreed to do so.¹⁷⁹ The large consumer ISPs’ refusals caused temporary—but not very short-lived—degradation in their user experience, but evidently the large consumer ISPs thought that cost was worth bearing. I believe it is the case that Comcast, Verizon, AT&T, and TWC have now reached direct connection agreements with Netflix at prices above what Netflix was paying for transit,¹⁸⁰ and Netflix represents that it has been coerced into these

¹⁷⁹ Kilmer Decl., ¶¶ 61–68.

¹⁸⁰ For Comcast, see Justin Bachman, “Comcast Turns Back Cord-Cutting Tide, Adds New Video Customers,” *Bloomberg Businessweek*, Apr. 22, 2014, accessed June 3, 2014, <http://www.businessweek.com/articles/2014-04-22/comcast-turns-back-cord-cutting-tide-adds-new-video-customers>. For Verizon, see Jon Brodtkin, “Netflix Pays Verizon for Network Connection to Speed up Video,” *Ars Technica*, Apr. 28, 2014, <http://arstechnica.com/tech-policy/2014/04/netflix-and-verizon-reach-interconnection-deal-to-speed-up-video/>. For AT&T, see Jon Brodtkin, “AT&T Might Fix Netflix Problems for its Customers before Verizon Does,” *Ars Technica*, July 29, 2014, <http://arstechnica.com/business/2014/07/att-might-fix-netflix-problems-for-its-customers-before-verizon-does/>. For TWC, see James O’Toole, “Faster Netflix Streaming Coming to Time Warner Cable,” *CNN Money*, Aug. 20, 2014, <http://money.cnn.com/2014/08/20/technology/netflix-time-warner-cable/>.

deals due to congestion of alternative routes for delivering Netflix traffic.¹⁸¹ This set of facts appears to display greater bargaining power among larger ISPs than among smaller ISPs: both in the adoption of tougher tactics and in the financial outcome.

¹⁸¹ Netflix Open Internet Comments at 12–16; Letter from Markham C. Erickson, Counsel to Netflix, Inc. to Marlene Dortch, Secretary, Federal Communications Commission (August 1, 2014), Attachment at 2.

VII. Increased leverage for access to Comcast and TWC subscribers is likely to harm consumers

- (178) Above, I discussed evidence that larger consumer ISPs are likely to be in a stronger bargaining position than smaller consumer ISPs in negotiating with content providers and content delivery networks. This stronger bargaining position is likely to be reflected (as I believe has already been observed) in the introduction of access charges where settlement-free interconnection had previously prevailed, and in higher access charges than would be the case if ISPs had less bargaining power.
- (179) After explaining that he does not expect such a shift in bargaining power, Dr. Israel then suggests:
- [E]ven if one were to conclude that, despite the evidence presented above, the transaction will significantly increase the combined firm's bargaining power vis-à-vis edge providers, such an effect is not itself anti-competitive. Put simply, shifts in bargaining power do not imply any reduction in total welfare.¹⁸²
- (180) In this section, I explain my reasons for disagreeing with that view. When larger consumer ISPs become better able to charge content providers more for access, harm is likely. The issues resonate with parts of the network neutrality debates.
- (181) First, depending on how content providers' pricing responds to (higher) access charges, one issue arises that is familiar to the Commission from the traditional terminating access problem and to parts of the antitrust community from the payment instruments industry. To the extent that price coherence prevails (i.e., content providers charge the same price regardless of which ISP a consumer uses), increases in access charges by one ISP may not result in higher prices for content for customers of only that ISP, but rather in higher prices paid by customers of all ISPs, including the rivals of the ISP initiating the price increase.
- (182) Second, to the extent that charging for access is accomplished by charging for a paid interconnection access as a form of second-degree price discrimination by willingness to pay, there is a price-discrimination incentive to artificially degrade the default or other alternatives. This incentive is reinforced if the content-provider customer is also a competitive threat. Large ISPs' slowness to expand capacity at interconnection ports serving Netflix may have been motivated by various factors, but the fact that Netflix competes against cable incumbents' video offerings would presumably be part of the picture in comparable disputes going forward.

¹⁸² Israel Decl., ¶ 105.

- (183) In this regard, the Commission found that “broadband providers may have incentives to increase revenues by charging edge providers, who already pay for their own connections to the Internet, for access or prioritized access to end users.”¹⁸³ In addition, the Commission found that “if broadband providers can profitably charge edge providers for prioritized access to end users, they will have an incentive to degrade or decline to increase the quality of the service they provide to non-prioritized traffic.”¹⁸⁴ The United States Court of Appeals for the District of Columbia concurred with the FCC’s view, stating, “Broadband providers also have powerful incentives to accept fees from edge providers, either in return for excluding their competitors or for granting them prioritized access to end users.”¹⁸⁵
- (184) Third, unless the pricing of access charges is uniform and transparent, there will be a tendency or temptation to price based on ex post willingness to pay, which risks confiscating quasi-rents for innovative and successful content. As noted in section V above, an ISP large enough to create even inferior in-house substitutes for such content may not be very worried about the long-run risks of such conduct and might even welcome such risks because the harm would affect its rivals more than the harm affects the ISP itself; but even if that factor does not apply, bargaining outcomes tend to respond to willingness to pay.
- (185) It may be helpful here to describe a simple price-theoretic version of the terminating access problem by using a hypothetical example in this context. Suppose that an ISP such as Comcast imposes a new terminating access charge on content providers, amounting to t per Comcast subscriber per month. Making homogeneity and other simplifying assumptions, one can use pass-through analysis to help understand the economic impacts of such an access charge.
- (186) If content providers simply pass that charge on to those of their subscribers who connect via Comcast, with no change in pricing to content subscribers who connect via other ISPs, then the result is as if Comcast had not imposed the new access charge but had simply raised its price to subscribers by t per month, which of course Comcast could alternatively simply do. In other words, in that simplified case, the ability to raise prices to a content supplier would make no real difference.
- (187) If the content providers instead absorb part of the t and pass on only rt (where perhaps $r < 1$) to Comcast-connecting customers and nothing to other customers, then Comcast gains the t per subscriber, lowering its effective marginal cost of subscribers by t ; meanwhile, its subscribers pay an additional rt to content providers, lowering their demand curve for a Comcast connection by rt . If Comcast’s pass-through rate for marginal costs is a , then its profit-maximizing price falls by at due to its follow-on per-subscriber revenue of t , and falls by $(1 - a)rt$ in response to the lower demand

¹⁸³ *Open Internet Order*, ¶ 24 (footnote omitted).

¹⁸⁴ *Open Internet Order*, ¶ 29 (footnote omitted).

¹⁸⁵ *Verizon v. FCC*, 740 F.3d 623 (2014 U.S. App. LEXIS 680), at *645–46 (D.C. Cir. 2014).

curve of its customers.¹⁸⁶ As a net result, its subscriber price falls by $[at + (1 - a)rt]$. Since its customers benefit from this lower price paid to Comcast but also must pay rt more for content, the net impact on a Comcast subscriber is a gain of $at(1 - r)$. Meanwhile by the envelope theorem, Comcast's per-customer gain is as if it did not change its subscriber quantity (requiring a cut of rt in its subscriber price), and is thus equal to $t - rt = t(1 - r)$. When $r < 1$, Comcast and its subscribers gain at the content providers' expense. This would be essentially a technique for rent extraction, and one would want to know what rents are being extracted and what investments led to them. The risk of such pricing extracting rents to investment, innovation, and efficiency would be compounded by some of the incentives to undermine independent complementors that I discussed above in sections IV.A and IV.B.

- (188) But neither of these two scenarios is very likely, because content providers seldom price differently to subscribers of different ISPs. For example, Sandvine lists the top ten peak period applications for data use in North America for 1H 2014. Of the ten applications, seven are content providers. Of those seven, four charge subscribers (Netflix, iTunes, Amazon Video, and Hulu), but none of them charge differently based on the ISP of the subscriber.¹⁸⁷
- (189) As the payments industry literature has studied, such uniformity is not in general the result of a knife-edge coincidence of costs and demand elasticity in different segments, but reflects the fact that unless gross margins are very low, it costs a firm very little (a second-order effect on profits) to set uniform prices when prices to different segments would (otherwise) optimally differ modestly. Thus, many content providers would not depart from uniform pricing in order to pass on differentially to consumers any access price increase that one consumer ISP might impose. As a special case of uniform pricing, many content providers, including popular ones such as YouTube, do not charge consumers for their content, thereby saving on transaction costs of consumer payments. Without incurring or imposing such transaction costs, those content providers cannot pass through any price increases that an ISP may assess on the content provider.
- (190) In such a context, a price increase on the part of the terminating access supplier (here, the ISP) lowers the net value that consumers derive from buying Internet access from other ISPs, including that ISP's rivals. That makes such a price increase analytically equivalent to raising rivals' costs. Thus, an increase in terminating access pricing power removes constraints on a potentially profitable but harmful and anticompetitive pricing pattern.

¹⁸⁶ Here I use the fact that a parallel downward \$1 shift in a firm's residual demand curve will cut the firm's profit-maximizing price by $$(1 - a)$, where a is the firm's pass-through rate for marginal costs. This result is derived by observing that, with generality, such a downward shift in demand together with a \$1 parallel downward shift in the firm's marginal cost curve will prompt a \$1 decrease in profit-maximizing price.

¹⁸⁷ Sandvine, *Global Internet Phenomena Report*, 1H 2014, at 6, available at, <https://www.sandvine.com/downloads/general/global-internet-phenomena/2014/1h-2014-global-internet-phenomena-report.pdf>.

- (191) Thus many content providers likely would not respond with price increases targeted solely at their Comcast-connecting customers, but any price increase for content would also apply to customers connecting through non-Comcast ISPs. Clearly, for Comcast to be able to fund an access charge out of non-Comcast subscribers' pockets is problematic.
- (192) If Comcast's share of content subscribers is s , then content providers' blended incremental cost per subscriber rises by st , so to the extent price coherence prevails, they are likely to raise subscriber prices by rst . All ISPs' customers face that increase, so to the extent that ISP pricing is determined by imperfect competition among ISPs, there will be little effect on the residual demand curve facing each one, including Comcast. Thus one would expect that Comcast's price should fall by about at , and its subscribers are better off if $rst < at$, or $rs < a$. But now the gains come not only at content providers' expense but at the expense of content-consuming customers who connect via ISPs other than Comcast—including Comcast's direct rivals. In other words, now the approach to raising price not only extracts rents from the content provider but also functions as a tax on Comcast's rival ISPs. This will tend to harm competition by weakening whatever constraint those rivals impose on Comcast.
- (193) For these reasons I believe that Dr. Israel is too optimistic in his very generic statement that it is not clear why a shift toward increased charging to content providers would be problematic. As explained here, there are good reasons to find such a shift problematic, especially to the extent that such a shift is powered by a concentration of bargaining power due to merger.

/s/ Joseph Farrell

Joseph Farrell, DPhil

August 25, 2014

Date

Appendix A. Regression results

- (194) A simple regression analysis supports the conclusion that congestion at Cogent’s ports with these six ISPs can partly explain the differences in Netflix’s performance across ISPs. In particular I estimated this simple model:

$$SPEED_{it} = \alpha_i + \beta CONGEST_{it} + \gamma_t t + error_{it}$$

where:

i = “ATT - DSL”, “ATT - U-Verse”, “CenturyLink -DSL”, “Charter”, “Comcast”, “Time Warner Cable”, “Verizon – DSL, and “Verizon Fios” — i.e. the eight end-user services’ performances Netflix tracks for the six ISPs Cogent delivered Netflix streams to;

t = 0,1,...18 — i.e., a monthly time trend for the 19 months between October 2012 ($t=0$) and April 2014 ($t=18$), the last full month for which I have data on Cogent’s traffic. I understand from Cogent that by October 2012 Cogent had started delivering a substantial amount of traffic for Netflix to the ISPs listed above, and had sometimes obtained port capacity augments to accommodate the increase in traffic.¹⁸⁸ For Comcast, I excluded the observations with t on or after March 2014 to account for the fact that Comcast signed a direct connection agreement with Netflix in February 2014.

$SPEED_{it}$ = Netflix prime time speed for end-user service i in month t .

$CONGEST_{it}$ = fraction of the prime time hours in month t during which the outbound traffic that Cogent handed over to ISP i across all ports was at or above 90% of available ports’ capacity, see Figure 16. For AT&T and Verizon the same $CONGEST_{it}$ applies to both the different DSL and fiber speeds Netflix records, respectively.

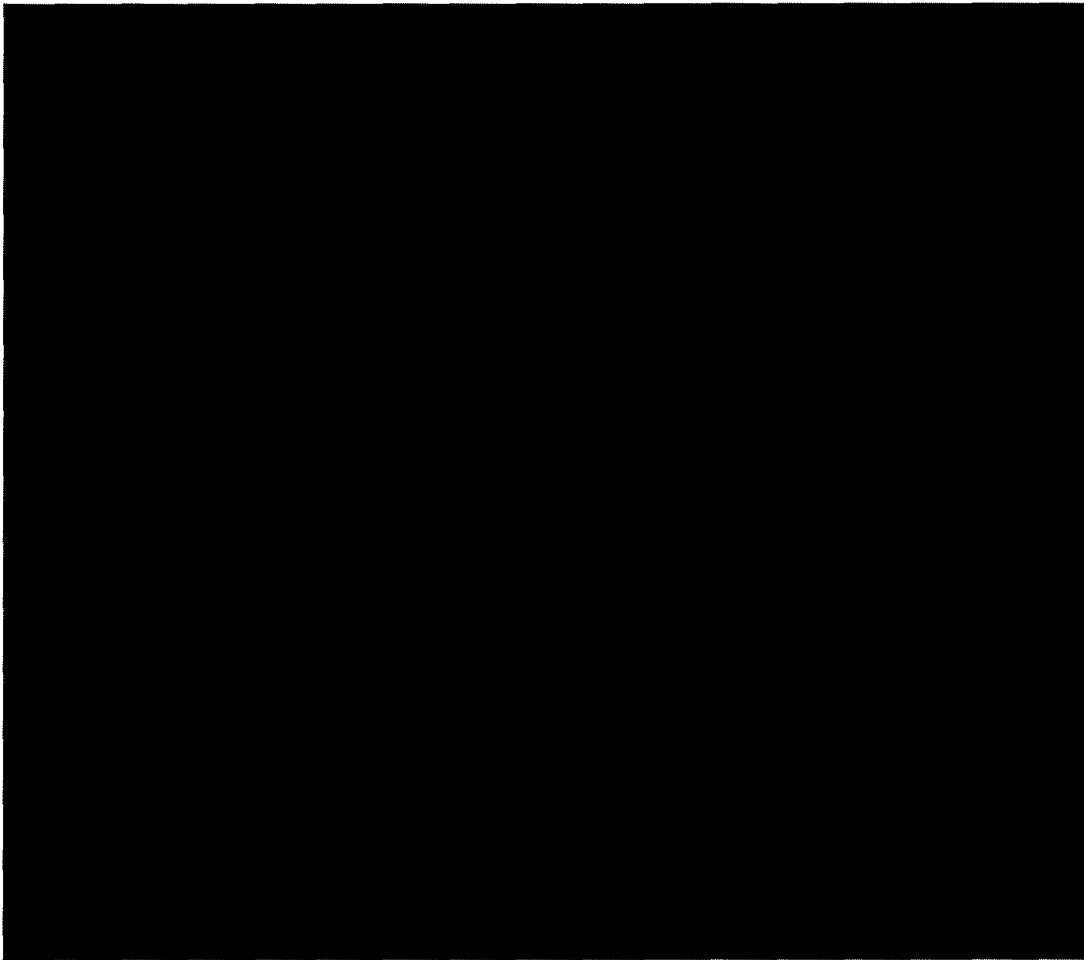
- (195) Figure 16 reports the results for the simple regression equation described above, where the omitted fixed-effect dummy is AT&T-DSL (i.e., the “base” over which all other service-fixed effects and their interaction with the time trend are computed). The regression explains $\{\{\text{REDACTED}\}\}$ of the observed variation, and the coefficient on congestion at Cogent’s ports is negative and statistically significant. The inclusion of ISP-specific time trends — which are negative and statistically significant for Comcast and AT&T (both DSL and U-Verse) — imply that the estimated coefficient

¹⁸⁸ Picking an earlier month (Netflix data is available since January 2012) or a slightly later month yields qualitatively similar results about the negative correlation between congestion and speed performance.

on the congestion variable may underestimate the true (negative) correlation between congestion and speed by attributing the deterioration in Comcast and AT&T's performance to a secular trend.¹⁸⁹ I also ran this regression without Charter, and the coefficient on the congestion index remains negative and significant.

¹⁸⁹ In a specification where the time trend is not interacted with ISP-specific dummies, the coefficient on congestion is negative and statistically significant (at the 1% confidence level), while the (overall) time trend coefficient is positive and statistically significant, picking up an overall secular improvement in Netflix performance ($R^2 = \{ \{ \text{[REDACTED]} \} \}$). Excluding the monthly time trend altogether produces an estimated coefficient on the congestion regressor that is essentially indistinguishable from the one reported in Figure 16.

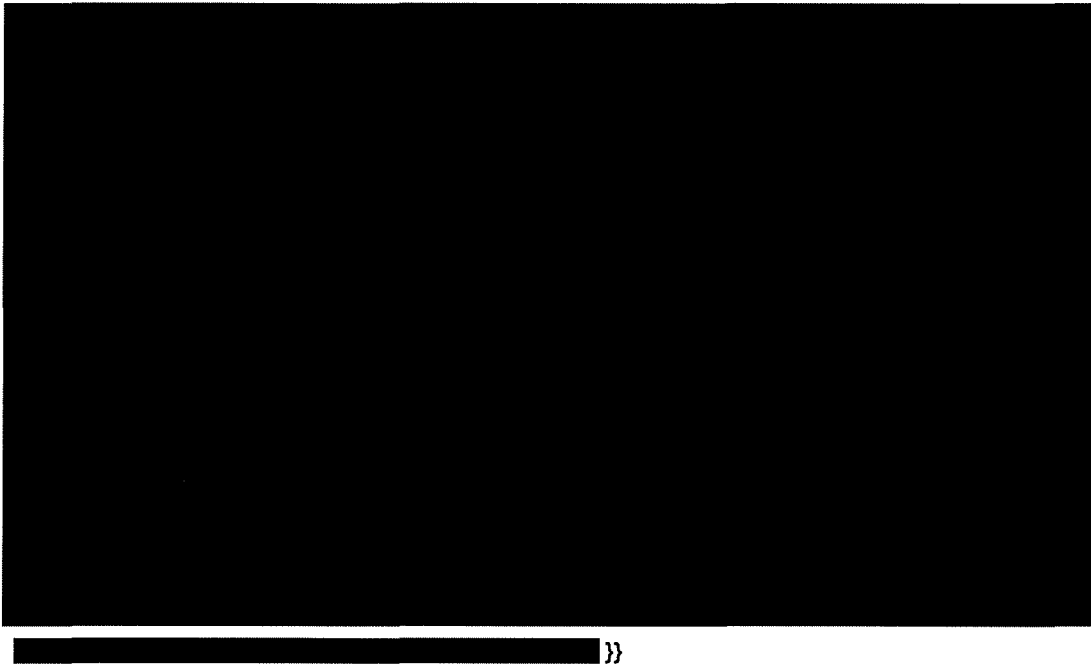
Figure 16. Regression results — 90% threshold, all technologies {{



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- (196) Figure 17 reports the results I obtained when including only cable companies in the estimation sample; in this case the omitted dummy is the one for Charter, which serves as the “base” over which fixed effects and the interacted time trend are computed. The estimated coefficient on the congestion variable is negative, statistically significant, and almost three times larger than in the main regression. The regression explains {{ [REDACTED] }} of the variation in the dependent variable.

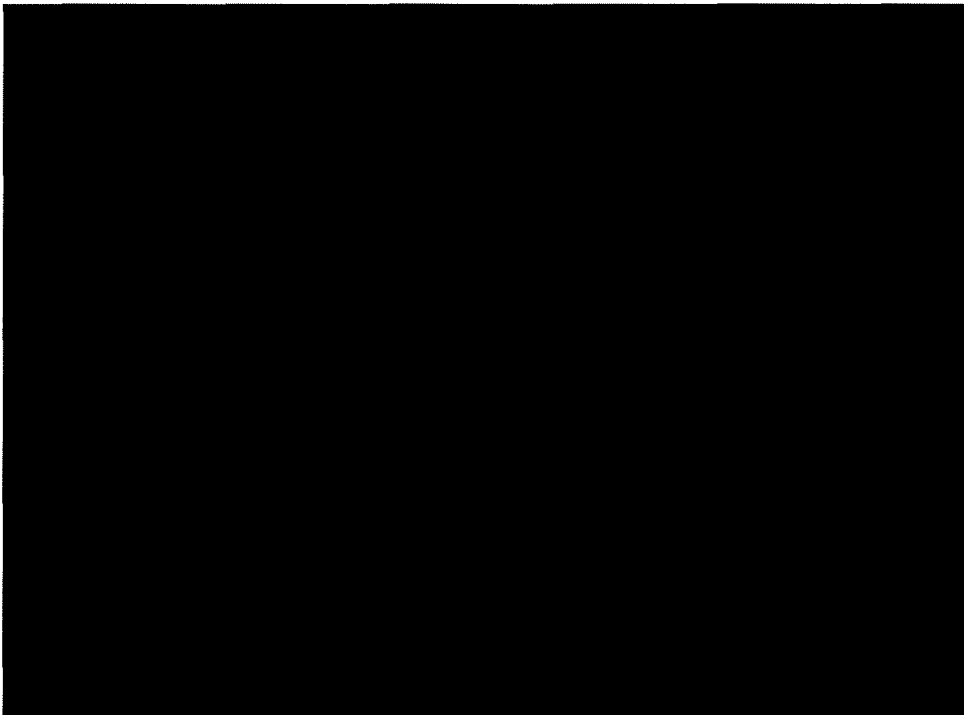
Figure 17. Regression results — 90% threshold, cable technology ISPs only {{



- (197) I also ran a number of sensitivity checks, including regressions using a 70% congestion index, and obtained negative and statistically significant coefficients in those regressions as well.

Appendix B. Cogent transit pricing

Figure 18. Cogent settlement free peering and transit pricing for cable companies {{



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Appendix C. Curriculum vitae

Joseph Farrell

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C.1. Education

- DPhil, Economics, Oxford University, United Kingdom
- MSc, Mathematics, Oxford University, United Kingdom
- BA, Mathematics, First Class Honours, Oxford University, United Kingdom

C.2. Selected publications

- “Freedom to Trade and the Competitive Process” (with Aaron Edlin). *Oxford Handbook of International Antitrust Economics*, eds. Roger D. Blair and D. Daniel Sokol (forthcoming).
- “Economics at the FTC: Drug and PBM Mergers and Drip Pricing” (with Howard Shelanski, Christopher Metcalf, Mary Sullivan, and Brett Wendling). *Review of Industrial Organization* (forthcoming).
- “Can Privacy Be Just Another Good?” *Journal on Telecommunications and High Technology Law* (forthcoming).
- “Keynote Address: Mosquitoes, Micropayments, and Privacy.” *Consumer Payment Innovation in the Connected Age: Proceedings of 2012 Federal Reserve payment systems conference*, Kansas City Fed: 89–97.
- “Market Data and Participants’ Views in Horizontal Merger Analysis.” *Concurrences* (2012); to be republished in *New Frontiers of Antitrust: A tribute to Bill Kovacic*, ed. Nicolas Charbit.
- “Choosing the Rules for Consensus Standardization” (with Tim Simcoe). *RAND Journal of Economics* 43, no. 2 (2012): 235–52.

- “Economics at the FTC: Hospital Mergers, Authorized Generic Drugs, and Consumer Credit Markets” (with David Balan, Keith Brand, and Brett Wendling). *Review of Industrial Organization* 39, no. 4 (2011): 271–96.
- “Fox, or Dangerous Hedgehog? Keyte and Schwartz on the 2010 Horizontal Merger Guidelines.” *Antitrust Law Journal* 77, no. 2 (2011): 661–68.
- “Four Paths to Compatibility” (with Tim Simcoe). *Oxford Handbook of the Digital Economy*, eds. Martin Peitz and Joel Waldfogel. New York: Oxford University Press (forthcoming).
- “Economics at the FTC: Mergers, Dominant-Firm Conduct, and Consumer Behavior” (with Janis Pappalardo and Howard Shelanski). *Review of Industrial Organization* 37, no. 4 (2010): 263–77.
- “Upward Pricing Pressure in Horizontal Merger Analysis: Reply to Epstein and Rubinfeld” (with Carl Shapiro). *Berkeley Electronic Press Journal of Theoretical Economics* 10, no. 1 (2010), available at <http://www.bepress.com/bejte/vol10/iss1/art41>.
- “Recapture, Pass-Through, and Market Definition” (with Carl Shapiro). *Antitrust Law Journal* 76 (2010): 585–604.
- “Upward Pricing Pressure and Critical Loss Analysis: Response” (with Carl Shapiro). *Competition Policy International*, February 2010.
- “Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition” (with Carl Shapiro). *Berkeley Electronic Press Journal of Theoretical Economics* 10, no. 1 (2010), available at <http://www.bepress.com/bejte/vol10/iss1/art9>.
- “Economics at the FTC: Retrospective Merger Analysis with a Focus on Hospitals” (with Paul Pautler and Michael Vita). *Review of Industrial Organization* 35 (2009): 369–85.
- “Intellectual Property as a Bargaining Environment.” *Innovation Policy and the Economy*, eds. Josh Lerner and Scott Stern. National Bureau of Economic Research/University of Chicago Press, 2008.
- “How Strong Are Weak Patents?” (with Carl Shapiro). *American Economic Review* 98, no. 4 (2008): 1347–69.
- “Merger to Monopoly to Serve a Single Buyer: Comment” (with Jonathan Baker and Carl Shapiro). *Antitrust Law Journal* 75, no. 2 (2008): 637–46.
- “Improving Critical Loss Analysis” (with Carl Shapiro). *Antitrust Source* (February 2008), available at <http://www.antitrustsource.com>.
- “Standard Setting, Patents, and Hold-Up” (with John Hayes, Carl Shapiro, and Theresa Sullivan). *Antitrust Law Journal* 74, no. 3 (2007): 603–70.

- “Coordination and Lock-In: Competition with Switching Costs and Network Effects” (with Paul Klemperer). *Handbook of Industrial Organization*, vol. 3, eds. Mark Armstrong and Robert Porter, 1967–2072. Amsterdam: Elsevier Science Publishing, 2007.
- “Do Investors Forecast Fat Firms? Diagnosing Profit Dissipation from Stock Market Values of Gold Mining Firms” (with Severin Borenstein). *RAND Journal of Economics* 38, no. 3 (2007): 626–47.
- “Compatibility and Competition Policy.” In *Standards and Public Policy*, eds. Shane Greenstein and Victor Stango, 372–88. Cambridge University Press, 2007.
- “The Economics of Welfare Standards in Antitrust” (with Michael L. Katz). *Competition Policy International* 2, no. 2 (2006): 3–28. Available at <http://www.esapience.org>.
- “Efficiency and Competition among Payment Instruments.” *Review of Network Economics* 5, no. 1 (2006): 26–44. Available at <http://www.bepress.com/rne/vol5/iss1/3>.
- “Open Access Arguments.” In *Net Neutrality or Net Neutering: Should Broadband Services be Regulated?* eds. Thomas Lenard and Randolph May, 195–214. New York: Springer, 2006. Available at <http://www.springerlink.com/content/h2wh8g/>.
- “Complexity, Diversity, and Antitrust.” *Antitrust Bulletin* 51, no. 1 (2006): 165–73.
- “Assessing Australian Interchange Regulation: Comments on Chang, Evans and Garcia Swartz.” *Review of Network Economics* 4, no. 4 (2005): 359–63. Available at <http://www.bepress.com/rne/vol4/iss4/6>.
- “Amicus Brief of 37 Business, Economics and Law Professors.” In *Tamoxifen Citrate* antitrust litigation, December 2005, written together with Mark Lemley and Carl Shapiro, also signed by 34 other professors of business, economics and law.
- “Deconstructing Chicago on Exclusive Dealing.” *Antitrust Bulletin* 50, no. 3 (2005): 465–80.
- “Innovation and Regulation” (invited review of part of *Economic Report of the President*). *Journal of Economic Literature* 43 (2005): 801–05.
- “Competition or Predation? Consumer Coordination, Strategic Pricing, and Price Floors in Network Markets” (with Michael L. Katz). *Journal of Industrial Economics* 53, no. 2 (2005): 203–31.
- “Incentives to Challenge and Defend Patents: Why Litigation Won’t Reliably Fix Patent Office Errors, and Why Administrative Patent Review Might Help” (with Robert P. Merges). *Berkeley Technology Law Journal* 19, no. 3 (2004). Available at http://btlj.boalt.org/data/articles/19-3_spring-2004_symp_6-farrell-merges.pdf.

- *The Economics of Information Technology*, Cambridge University Press, December 2004. Translations into Chinese and Italian. Available at <http://www.cambridge.org/uk/catalogue/catalogue.asp?isbn=0521605210>.
- “Listening to Interested Parties in Antitrust: Competitors, Customers, Complementors, and Relativity.” *Antitrust* 18, no. 2 (2004): 64–68.
- “Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age” (with Philip Weiser). *Harvard Journal of Law and Technology* 17, no. 1 (2003): 85–135, available at <http://jolt.law.harvard.edu/p.cgi/articles/v17.html>.
- “Negotiation and Merger Remedies: Some Problems.” In *Merger Remedies in American and European Union Competition Law*, eds. Francois Leveque and Howard Shelanski. Cheltenham, UK: Edward Elgar, 2003.
- “Integration and Independent Innovation on a Network.” *American Economic Review* 93, no. 2 (2003): 420–24.
- “The American Airlines Case: A Chance to Clarify Predation Policy” (with Aaron Edlin). In *The Antitrust Revolution*, 4th edition, eds. John Kwoka and Lawrence White, 502–27. Oxford University Press, 2003.
- “Market Structure, Organizational Structure, and R&D Diversity” (with Richard Gilbert and Michael L. Katz). *Economics for an Imperfect World: Essays in Honor of Joseph E. Stiglitz*, eds. Richard Arnott and others, 195–220. Cambridge, MA: MIT Press, 2003.
- “Renegotiation in the Repeated Amnesty Dilemma, with Economic Applications” (with Georg Weizsäcker). In *Business Applications of Game Theory*, eds. Kalyan Chatterjee and William Samuelson. Boston: Kluwer Academic Publishers, 2001, available at <http://www.springerlink.com/content/v64865/>.
- “Monopoly Slack and Competitive Rigor.” In Eric Rasmusen, *Readings in Games and Information*. Oxford: Blackwell Publishing, 2001.
- “Scale Economies and Synergies in Horizontal Merger Analysis” (with Carl Shapiro). *Antitrust Law Journal* 68 (2001): 685–710.
- “Innovation, Rent Extraction, and Integration in Systems Markets” (with Michael L. Katz). *Journal of Industrial Economics* 48, no. 4 (2000): 413–32.
- “The Professor and the Madmen: Review of New *Palgrave Dictionary of Economics and the Law*.” *Economic Journal* 110 (2000): 842–45.

- “Renegotiation in Repeated Oligopoly Interaction.” In *Incentives, Organisation, and Public Economics: Papers in Honour of Sir James Mirrlees*, eds. Gareth Myles and Peter Hammond. Oxford University Press, 2000.
- “Using Cost-Cutting Announcements to Diagnose X-Inefficiency” (with Severin Borenstein). *American Economic Review* 90, no. 2 (2000).
- Reprinted in National Bureau of Economic Research, *Industrial Technology and Productivity: Incorporating Learning from Plant Visits and Interviews into Economic Research*, 2000.
- “Inside the Pin Factory: Empirical Studies Augmented by Manager Interviews” (with Severin Borenstein and Adam Jaffe). *Journal of Industrial Economics* 46, no. 2 (1998): 123–24, editorial introduction.
- “The Effects of Antitrust and Intellectual Property Law on Compatibility and Innovation” (with Michael L. Katz). *Antitrust Bulletin* (Fall/Winter 1998): 609–50.
- “Cheap Talk and Coordination.” In *The New Palgrave Dictionary of Economics and the Law*, ed. Peter Newman, 224–27. London: McMillan, 1998. Discussion of article by Church and Ware, in *Competition Policy and Intellectual Property Rights in the Knowledge-Based Economy*, eds. R. Anderson and N.T. Gallini. University of Calgary Press, 1998.
- “The Vertical Structure of Industry: Systems Competition versus Component Competition” (with Hunter Monroe and Garth Saloner). *Journal of Economics and Management Strategy* 7, no. 2 (1998): 143–82.
- “Public Policy and Private Investment in Advanced Telecommunications Infrastructure” (with Michael L. Katz). *IEEE Communications Magazine* 36, no. 7 (1998): 87–92.
- “Prospects for Deregulation in Telecommunications.” *Industrial and Corporate Change* 6, no. 4 (1997): 719–40.
- “Creating Local Competition.” *Federal Communications Law Journal* 49, no. 1 (1996): 201–15.
- “Cheap Talk” (with Matthew Rabin). *Journal of Economic Perspectives* 10, no. 3 (1996): 103–18.
- “Harnesses and Muzzles: Greed as Engine and Threat in the Standards Process,” *StandardView* 4, no. 1 (1996): 29–31.
- Reprinted in *The Standards Edge*, ed. Carl Cargill, 2002.
- “Brief Amicus Curiae” to Supreme Court, *Lotus v. Borland*, December 1995. Written with Glenn Woroch; signed by 13 other economists. Available at <http://www.softwareindustry.org/issues/docs-htm/brf-econ.html>.
- “Talk is Cheap.” *American Economic Review* 85, no. 2 (1995): 186–90.

- “The Economic Role of Standards.” In *The Changing Nature of Telecommunications/Information Infrastructure*. Washington, DC: National Academy Press, 1995.
- “Some Arguments for Weaker Intellectual Property Protection in Network Industries.” *StandardView* 3, no. 2 (1995): 46–49.
- Reprinted in *Standards Policy and Information Infrastructure*, eds. Brian Kahin and Janet Abbate, 368–77. Cambridge, MA: MIT Press, 1995.
- “Cheap Talk about Specific Investments” (with Robert Gibbons). *Journal of Law, Economics, and Organization* 11, no. 2 (1995).
- “Irrational Behavior in the AT&T Investment Game” (with Suzanne Scotchmer). *Economics Letters* 45, no. 4 (1994): 471–74.
- “Choosing How to Compete: Strategy and Tactics in Standardization” (with Stanley M. Besen). *Journal of Economic Perspectives* 8 (1994): 117–31.
- “Meaning and Credibility in Cheap-Talk Games.” *Games and Economic Behavior* 5 (1993): 514–31.
- Reprinted in *Mathematical Models in Economics*, eds. Michael Bacharach and Michael Dempster. Oxford University Press, 1997.
- “The Dynamics of Bandwagons” (with Carl Shapiro). In *Problems of Coordination in Economic Activity*, ed. James W. Friedman, chapter 8. Boston: Kluwer Academic Publishers, 1994.
- “Standard Setting in High-Definition Television” (with Carl Shapiro). *Brookings Papers on Economic Activity: Microeconomics* (1992): 1–93.
- “Converters, Compatibility and the Control of Interfaces” (with Garth Saloner). *Journal of Industrial Economics* 40, no. 1 (1992): 9–36.
- Discussion of article by Franklin M. Fisher, *Brookings Papers on Economic Activity: Microeconomics* (1991): 231–40.
- Review of *Changing the Rules: Technological Change, International Competition, and Regulation in Telecommunications*, eds. Robert W. Crandall and Kenneth Flamm. *Journal of Economic Literature* 29 (1991): 1204–05.
- “The Role of the ITU in Standardization: Pre-Eminence, Impotence, or Rubber Stamp?” (with Stanley M. Besen). *Telecommunications Policy* (1991): 311–21.
- “Horizontal Mergers and Antitrust Policy: Reply” (with Carl Shapiro). *American Economic Review* 81 (1991): 1007–11.
- “One-Sided Patience with One-Sided Communication Does Not Justify Stackelberg Equilibrium” (with Eddie Dekel). *Games and Economic Behavior* 2 (1990): 299–303.

- “Decentralization, Duplication, and Delay” (with Patrick Bolton). *Journal of Political Economy* 98 (1990): 803–26.
- “The Economics of Standardization: A Guide for Non-Economists.” In *An Analysis of the Information Technology Standardization Process: Proceedings of the International Symposium on Information Technology Standardization*, eds. John L. Berg and Harald Schummy, 189–98. Amsterdam: North-Holland, 1990.
- “Asset Ownership and Market Structure in Oligopoly” (with Carl Shapiro). *Rand Journal of Economics* 21 (1990): 275–92.
- “Renegotiation in Repeated Games” (with Eric Maskin). *Games and Economic Behavior* 1 (1989): 327–60.
- Reprinted in *Recent Developments in Game Theory*, ed. Eric Maskin, 388–421. Cheltenham, UK: Edward Elgar, 1999.
- “Horizontal Mergers: An Equilibrium Analysis” (with Carl Shapiro). *American Economic Review* 80, no. 1 (1990): 107–26.
- Reprinted in *Takeovers Volume I*, eds. A.D. Cosh and Allan Hughes, International Library of Management.
- Reprinted in Louis Philips, *Applied Industrial Economics*. Cambridge University Press, 1998.
 - Reprinted in *Recent Developments in Monopoly and Competition Policy*, ed. George Norman. Cheltenham, UK: Edward Elgar, 2008.
- “Cheap Talk with Two Audiences” (with Robert Gibbons). *American Economic Review* 79 (1989): 1214–23.
- “Renegotiation-Proof Equilibrium: Reply” (with Eric Maskin). *Journal of Economic Theory* 49 (1989): 376–78.
- “Evolutionary Stability in the Repeated Prisoner’s Dilemma” (with Roger Ware). *Theoretical Population Biology* 36 (1989): 161–66.
- “Standardization and Intellectual Property.” *Jurimetrics Journal* 30, no. 1 (1989): 35–50.
 - Reprinted in *Intellectual Property*, ed. Peter Drahos, chapter 5. Aldershot, UK: Dartmouth, 1999.
- Reprinted in *The Economics of Intellectual Property*, eds. Ruth Towse and Rudi Holzhauer, chapter 22. Cheltenham, UK: Edward Elgar, 2002.
- “Competition Between and Within Teams: The Lifeboat Principle” (with Eric Lander). *Economics Letters* 29 (1989): 205–08.

- “Optimal Contracts with Lock-In” (with Carl Shapiro). *American Economic Review* 79, no. 1 (1989): 51–68.
- “Second-Sourcing as a Commitment: Monopoly Incentives to Attract Competition” (with Nancy T. Gallini). *Quarterly Journal of Economics* 103 (1988): 673–94.
- “Cheap Talk Can Matter in Bargaining” (with Robert Gibbons). *Journal of Economic Theory* 47 (1989): 221–37.
 - Reprinted in *Bargaining with Incomplete Information*, eds. Peter B. Linhart, Roy Radner, and Mark A. Satterthwaite. Waltham, MA: Academic Press, 1992.
- “Communication, Coordination, and Nash Equilibrium.” *Economics Letters* 27, no. 3 (1988): 209–14; misprint corrected in *Economics Letters* 33, no. 3 (1990): 299.
- “Coordination Through Committees and Markets” (with Garth Saloner). *Rand Journal of Economics* 19 (1988): 235–52.
- “Puzzles: Sylvia, Ice Cream, and More.” *Journal of Economic Perspectives* 2 (1988): 175–82.
- “Dynamic Competition with Switching Costs” (with Carl Shapiro). *Rand Journal of Economics* 19 (1988): 123–37.
- “Information and the Coase Theorem.” *Journal of Economic Perspectives* 1 (1987): 113–29.
 - Reprinted (in part) in *Economics of the Public Sector: Readings and Commentary*, eds. S. Baker and C. Elliott, Lexington, MA: Heath, 1989.
- “Partnerships” (with Suzanne Scotchmer). *Quarterly Journal of Economics* 103 (1988): 279–97.
- “Competition with Lock-In.” In *Telecommunications Demand Modeling: An Integrated View*, eds. de Fontenay, Shugard, and Sibley, 353–62. Amsterdam: North-Holland, 1990.
- “Competition, Compatibility and Standards” (with Garth Saloner). In *Product Standardization and Competitive Strategy*, ed. H. Landis Gabel, 1–18. Amsterdam: North-Holland, 1987.
- “Rigidity versus License.” *American Economic Review* 77 (1987): 195–97.
- “Cheap Talk, Coordination and Entry.” *Rand Journal of Economics* 18 (1987): 34–39.
 - Reprinted in Eric Rasmusen, *Readings in Games and Information*, chapter 30. Oxford, UK: Blackwell, 2001.
 - Reprinted in *Game Theory: Critical Concepts in the Social Sciences*, eds. Yanis Varoufakis and Anthony Housego. New York: Routledge, 2001.
- “Experience Rating and Premium Risk.” *Economics Letters* 21 (1986): 311–14.
- “Installed Base and Compatibility: Innovation, Product Preannouncements, and Predation” (with Garth Saloner). *American Economic Review* 76 (1986): 940–55.

- Reprinted in *The Economics of Innovation Policy*, ed. Albert N. Link, chapter 10. Cheltenham, UK: Edward Elgar, 2008.
- “Economic Issues in Standardization” (with Garth Saloner). *Telecommunications and Equity: Policy Research Issues*, ed. James Miller, 165–178. Amsterdam: North-Holland, 1986.
- “Moral Hazard as an Entry Barrier.” *Rand Journal of Economics* 17 (1986): 440–49.
- “A Note on Inertia in Market Share.” *Economics Letters* 21 (1986): 73–75.
- “Voluntary Disclosure: Robustness of the Unraveling Result.” In *Antitrust and Regulation*, ed. R. Grieson, 91–103. Lexington, MA: Lexington Books, 1986.
- “Standardization and Variety” (with Garth Saloner). *Economics Letters* 20 (1986): 71–74.
- “How Effective is Potential Competition?” *Economics Letters* 20 (1986): 67–70.
- “Owner-Consumers and Efficiency.” *Economics Letters* 19 (1985): 303–306.
- “Standardization, Compatibility and Innovation” (with Garth Saloner). *Rand Journal of Economics* 16, no. 1 (1985): 70–83.
- Reprinted in *The Economics of Information*, eds. Steven A. Lippman and David K. Levine, chapter 18. Cheltenham, UK: Edward Elgar, 1995.

C.3. Professional activities and honors

- Fellow, Econometric Society, 2002–present
- Senior Consultant, Charles River Associates, 2003–2009
- Board of Editors, *Information Economics and Policy*, 2004–2007
- Chair, Competition Policy Center, 1999–2006
- Co-Chair, American Bar Association conference on antitrust in high technology, June 2005
- Faculty, New York University graduate workshop on economics of technology, June 2005
- Computer Science/Telecommunications Board, National Academy of Sciences, 2001–2004
- Scientific Committee, Toulouse, 2004
- Vice-Chair, Economics Committee, Antitrust Section, American Bar Association, 2001
- Editor, *Journal of Industrial Economics*, 1995–2000 (previously Associate Editor)
- Program Committee, Econometric Society, June 1992; American Economic Association, January 2000
- President, Industrial Organization Society, 1996

- Reviewer, US Office of Technology Assessment: “Computer Software and Intellectual Property,” *Finding a Balance*, 1992
- Global Standards: Building Blocks for the Future, March 1992
- Organizing Committee, Telecommunications Policy Research Conference, April 1986
- Organized the GTE Laboratories Economics Symposium, August 1985
- Reviewer, National Academy of Sciences/National Research Council
- “Highly Cited Researcher” Economics/Business, ISI (<http://isihighlycited.com>)
- Referee for multiple economics journals, research agencies, publishers, etc.
- Witness, US Senate Judiciary Committee, FCC, FTC, and DOJ hearings
- Consultant for Department of Justice, Federal Trade Commission, Canadian Bureau of Competition, Reserve Bank of Australia, and private parties
- University and departmental administrative service including past service as Chair of the Competition Policy Center, Chair of the Graduate Committee, membership of the Personnel Committee and Undergraduate Committee, promotion and tenure committees, and ad hoc committee

C.4. Academic advisory boards

- Consortium on Telecommunications Policy (1997)
- Power and Telecom (1997–1999)
- Economics of Innovation and New Technology (1990–1995)
- Centre for Competition Policy (UK), 2004–2008

C.5. Professional experience

- University of California, Berkeley
 - Professor of Economics, 1991–present
 - Affiliated Professor, Haas School of Business, 1994–present
 - Associate Professor, 1989–1991
 - Visiting Assistant Professor, 1986–1988
- Director, Bureau of Economics, US Federal Trade Commission, June 2009–May 2012

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- Deputy Assistant Attorney General and Chief Economist, Antitrust Division, US Department of Justice, July 2000–June 2001
- Chief Economist, Federal Communications Commission, January 1996–June 1997
- Chair, Competition Policy Center, 1999–2006
- National Fellow, Hoover Institution, Stanford University, 1988–1989
- Technical Staff, GTE Laboratories
 - Principal Member, 1985–1986
 - Senior Member, 1984–1985
- Massachusetts Institute of Technology
 - Assistant Professor of Economics, 1980–1984
 - Instructor, 1979–1980
- Visitor, Bell Laboratories, Summer 1978
- Visiting Assistant Professor, University of California, San Diego, Spring 1983